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ROCK CARVINGS

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ROYAL SOCIETY OF SOUTH AUSTRALIA.

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The Field Naturalists' Section of The Royal Society of South Australia

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THIS Section was founded in 1883 for the purpose of affording observers and lovers of Natural History regular and frequent opportunities for discussing those special subjects in which they are naturally interested; for the Exhibition of Specimens; and for promoting Observations in the Field by means of Excursions to various collecting grounds around the Metropolis.

THE MONTHLY MEETINGS of the Section for Lectures, the Reading of Papers, and Exhibition of Specimens are held on the third Tuesday, at 8 p.m., at the Royal Society's Rooms, Institute Buildings, North Terrace, Adelaide.

MEMBERS are requested to invite their friends to these Monthly Meetings.

VISITORS CORDIALLY INVITED.

THE ANNUAL SUBSCRIPTION (7/6) dates from August 1, and can be sent to Mr. E. H. Ising, Railway Station, Adelaide.

MEMBERS are urged to take Receptacles for the carrying of Specimens. At each outing every member is expected to collect Specimens wherever possible, and to hand them to the Leader for identification, etc.

EXCURSIONS. For meeting places, see particulars on back cover. Members desirous of attending motor excursions should advise the Hon. Secretary at least three days before the outing, to enable sufficient accommodation to be provided.

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F.N.S. HERBARIUM. The Herbarium is kept in the Museum, and is open to members. Mr. W. M. Nielsen, Hon. Secretary.

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Rock Carvings And Other Aboriginal Relics From Near Marree

By

H. M. COOPER.

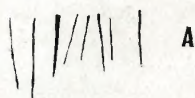
An interesting and very extensive series of rock carvings exists on both banks of Boorloo Creek, a picturesque and rocky gum-creek, on Callanna Station, near Marree. The country in the vicinity, which it drains, is exceedingly rough and comprises, in the main, low ridges and hills. The creek flows eastward into the River Frome and thence to Lake Eyre. Boorloo Mound Springs are distant about three miles downstream from the carving site. This is the nearest permanent water, at least during recent years, but there is a soak in the bed of the creek amongst the carvings. Parallel outcrops of ancient rock, separated by narrow stony flats,

reformed on the chiselled out portions of some of the designs, probably indicating that those at least are of no little antiquity. Stone implements of a crude type generally, are scattered over the stony flats already referred to and denote the former presence of some ancient culture but, due to lack of concrete evidence, there are no grounds for assuming this to be the work of the same peoples. Turning to the individual carvings themselves, the front cover features what is one of the most attractive of those so far discovered in this locality. It is nicely balanced and exhibits considerable skill in its execu-

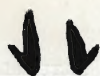


afforded a generous opportunity for natives long ago to make these records of their art, and even a cursory examination of the many vertical and horizontal faces proved these to have been availed of to an extreme degree. Further, the rocky bed of the creek in some places was utilised for the same purpose. It may be mentioned that the typical rusty glaze, so prominent on rocks in these arid regions, has completely

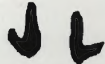
tion. The human footprints and those of marsupials, together with what may be two spears or clubs and a boomerang, could almost portray a picture of a typical day in the life of Australia's primitive man. It has been observed that almost invariably, throughout this and other series, the kangaroo or wallaby footprints or pads, whatever their dimension, occur in pairs. Continuing, A shows two groups of irregular lines or



A



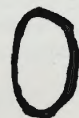
C



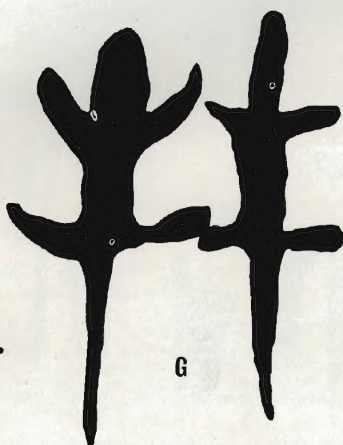
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B



E



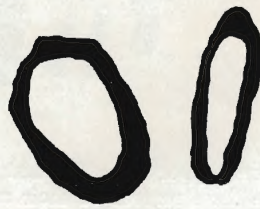
G



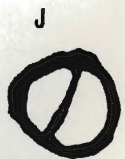
I



F



K



J



H

10 CM

scratchings whose meaning is obscure, whilst B probably depicts a lizard. C could almost record a rather realistic impression of a hunter stalking a kangaroo, as depicted by the marks left by hunter and hunted. D shows a deeply cut circle containing typical animal tracks, and E a single pair. F is certainly most striking, even if only for speculation as to its true meaning. G may represent two more lizards, and H three pairs of kangaroo pads, and the smaller ones possibly those of birds. I, in contrast to all the other designs herewith reproduced, has been neatly surface "pecked" and not cut out. J, the typical barred circle of the well-known Mount Chambers group, is rare at Boorloo Creek, and finally, K, the plain circle, represents a carving which is so plentiful in the Northern Flinders Ranges and other areas south of

Marree. Unfortunately, due to superimposition and severe weathering, the outlines of many carvings are so doubtful as to render their true deciphering difficult, if not impossible. The broken and confused nature of the country probably rendered the results of three visits by the writer incomplete. Finally, when reviewing the art of our stone age peoples, often showing considerable skill and always infinite patience, it is well to make generous allowance for the primitive material with which, from necessity, they had to produce their irreplaceable work.

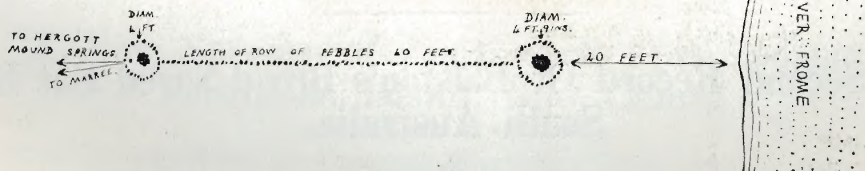
Stone implements and flakes collected in the vicinity were principally discoidal adze stones and irregular flaked knives, also two of the so-called "sumatra" hand choppers made from pebbles, which bear considerable resemblance to those from Kangaroo Island.

Pebble Design Near Marree

Situated on a stony rise by the western bank of the River Frome, three miles E.S.E. from Marree, there is a pebble design.

It comprises two circles of large water-worn pebbles, connected by a single row of stones of the same material. In the centre of each

circle is a low heap of similar stones. One end of the design points roughly in the direction of Hergott Mound Springs. It is not known whether this is of any significance, nor could the writer obtain any information locally as to the nature or purpose of the occurrence.



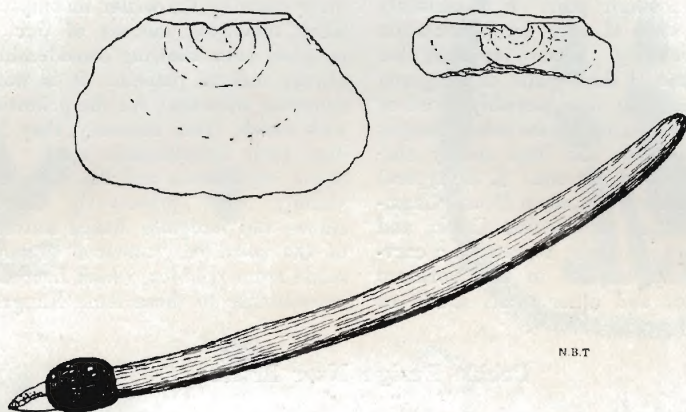
Native Camp Site

There is a native camp site worthy of notice at Coolong Springs, about three miles in a south-easterly direction from the pebble design just mentioned, but on the further side of the River Frome, which in times of heavy flood may flow in a stream two miles wide. A group of low, eroded, sandy ridges partly encloses a barren depression, on the floor of which exist the springs, a small group

of permanent waters, some of which, however, have filled up and ceased to flow. These ridges carry a large accumulation of stone implements and flakes, denoting considerable native activity in the past. The predominating artefact is an adze stone, discoidal in shape, varying considerably in size and which may be divided into two classes, the first, a beautifully made implement of superior

material and probably traded from outside sources, and the other a product of the local industry. The latter, whilst inferior to the former in its manufacture, is of similar design; it is, however, superior to the crude

another, formerly similar, but which, after repeated sharpening by re-edging, had reached a stage whence no amount of human ingenuity could render it of any further service. Collections are being made and



implements already mentioned as having been found in the vicinity of the Boorloo rock carvings. Since nearly 50 per cent. of the apparently traded variety had been worn down by continual use to a remarkable degree, it would seem that their possessors valued them highly and found replacement difficult. The accompanying drawing shows a typical adze stone of this class and

studied at the South Australian Museum in an endeavor to determine whence these finely-worked flakes are derived. Mr. N. B. Tindale, who has been interested in this problem for some time, has kindly supplied me with the drawing. A side view is given of an adze with the stone set in position in a mass of gum on the end of a curved wood handle.

A Second Record Of Balston's Broad-Nosed Bat In South Australia

By

E. F. BOEHM

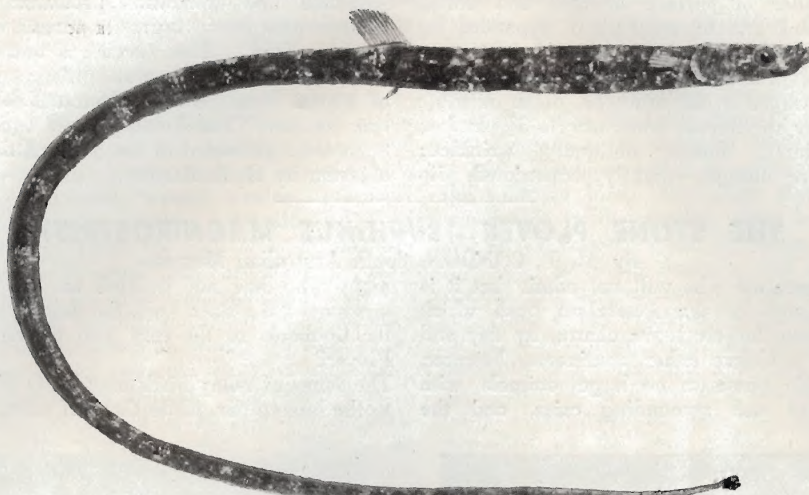
Sutherlands, S.A., 2/4/1941.

In Wood Jones' "Mammals of South Australia," pt. 3, pp. 425-6, 1925, a single South Australian example of Balston's Broad-nosed Bat (*Scoteinus balstoni*, Thomas, 1906) is recorded from Riverton. The species was originally named from a specimen collected at Laverton, Central Western Australia, by G. C. Shortridge.

An additional South Australian example of this interesting Bat was obtained in the south-

east of this State in 1933. It was secured together with a colony of Western Free-tailed Bats (*Micronomus planiceps*, Peters, 1866) in a "hill gum" (*Eucalyptus* sp.), about 18 feet up from the ground.

Details of the specimen, which is now in my collection, are as follows:—No. 126, male, Bool Lagoon, South-East, South Australia. 21st October, 1933. Expanse 35 mm. Collector, Mr. J. B. Hood.



The Smooth Pipe-Fish

Several specimens of the Smooth Pipe-Fish (*Lissocampus caudalis*) were taken in about five fathoms, off Semaphore, during the Field Naturalists' dredging excursion on Easter Monday, April 14, 1941. This little species, which attains a length of about four inches, was previously known only from two specimens taken at Kangaroo Island in 1901. These were described by Messrs Waite and Hale in 1921.

This small Pipe-Fish differs from all our other species in having a smooth body, devoid of all ridges.

Mr. B. C. Cotton reports that in an aquarium, a living example appeared to support itself against the glass with the last half-inch or so of the tail.

The species is possibly not rare in St. Vincent Gulf, but its small size and protective coloration have probably assisted it to escape detection.

H. M. HALE.

A New Species Of Land Shell From Salamo, Fergusson Island, New Guinea

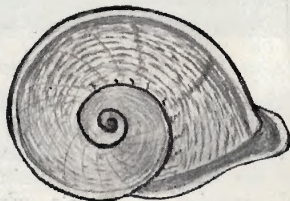
By BERNARD C. COTTON.

H. R. Bartlett has collected many interesting specimens of shells in New Guinea, and it is hoped that a full report on his discoveries will be published later. A new and pretty land shell recently taken by him is here described.

PAPUINA BARTLETTI, Sp. Nov.

Holotype, Salamo, Fergusson Island, D'En-

trescasteaux Group, about 70 miles from Samarai, Papua, on a volcanic flat. Reg. No. D. 14080, S.A. Mus., height 20 mm., major diameter 32 mm., minor diameter 23 mm. Imperforate, depressed, turbinate, convex above and below periphery; ground colour white or pink, with a white peripheral band defined by an indefinite brown line above and below;



remainder of surface streaked and dotted with pink and brown, back of expanded lip golden yellow; spire of medium height, apex obtuse, protoconch of $1\frac{1}{2}$ whorls, polished black tipped in the holotype, black or white in other specimens; adult whorls $3\frac{1}{2}$, surface irregularly, finely, obliquely wrinkled; aperture oblique, slightly constricted, lip

expanded and somewhat produced at the medium periphery; columella adnate, without tooth or fold. This species is one of the "*Helix louisianensis*" group, different species of which occur on the different islands in this locality. The holotype and two paratypes were presented to the South Australian Museum by H. R. Bartlett.

THE STONE PLOVER (*BURHINUS MAGNIROSTRIS*)

By H. T. CONDON, South Australian Museum.

Few there are who will not admit that it is the sounds of the Australian bush which contribute largely to its charm, by day and night. Unlike other continents, however, Australia possesses no large animals with fearsome and resounding cries, and the

night who has not thrilled to the harsh screams of the Barn Owl, the doleful call of the Boobook, or the eery wail of the Stone Plover?

The songs of many birds may bring pleasure to the human ear, while those of others, such



(Photos by H. T. Condon.)

camper or traveller hears only the calls of birds. By day, there is the ceaseless chattering of small birds of all kinds, the carolling of the Magpies on the plains and the musical screeches of Parrots, while at

as the persistent calls of the Cuckoos in spring-time become extremely monotonous; others again induce fear and foreboding in the lay mind. Some years ago, at Stanley Flat, near Clare, South Australia, there were

persistent reports of a "ghost" which sat on a road bridge and prevented travellers from crossing at night—with "huge outspread wings" and "uttering a wailing cry." The tale was investigated and the "ghost" proved to be a Stone Plover. The Stone Plover was at one time common on the Adelaide plains and adjacent hill country, but now its melancholy drawn out notes, "weeloo, weeloo," are never heard anywhere within a 10-mile radius of Adelaide. From its call it is erroneously called the "Curlew," and care, therefore, must be taken by those unacquainted with the species not to confound it with the migratory Curlew (*Numenius cyanopus*), a bird of the seashores and swamps, which is generically and specifically distinct. The true Curlew is at once recognised by its long curved beak, and calls "Curlee, curlee." There is no doubt that the call of the Stone Plover is the weirdest of all bird calls heard after nightfall in the Australian bush. It is commenced by one bird, and gradually taken up by all in the neighborhood until there is a perfect chorus of these dismal sounds. The calls are made either while on the ground or on the wing, and they frequently call before rain falls. Following the "weeloo" call is a rapidly uttered shrill note, which is loud and penetrating.

The flight is perfectly silent, with head held low and legs straight out behind. There is a conspicuous white mark on the wing, with a black spot in the middle of it. The birds are usually seen in pairs. In the day time it is often difficult to make them flush, as they rely largely on their protective colouration to escape detection. They are curious birds, and will not fly far from an intruder. There is a white mark over the eye, which extends halfway down the neck, and the white stripes on the wing are also very noticeable. Their movements on the ground are furtive and they will try and avoid an intruder in a most sneaking fashion, or else crouch immobile on the ground until danger passes. The Stone Plover is largely nocturnal in habits, when much of its food in the shape of insects, grubs, worms, and small molluscs, is obtained. In places where they occur, they will often be heard calling on moonlight nights.

The Stone Plover, which occurs in all parts of Australia, is variously known as the Stone-Curlew, Curlew, Thick-knee, Scrub Curlew, and Willaroo. In South Australia it is now

chiefly confined to the interior and to various islands off the coast, including Kangaroo Island. They are very common in the Port Lincoln district. In the north-west of Australia and in the Northern Territory there is a smaller race, the Little Stone-Plover (*Burhinus magnirostris rufescens* Math.), which is said to be more rufous in colouration than the southern bird. The genus *Burhinus* is world-wide in distribution, there being one species in Europe, three in Africa, one in Asia, two in South America, and each has various geographical races. They belong to the avian order Charadriiformes, which includes the Wading Birds and perhaps also the Gulls and Terns, and Auks and Puffins. The Stone Plover is one of a few Australian birds which make no nest, the eggs being deposited on the bare ground. In such situations, the eggs, usually two in number, closely resemble their environment in colour, and often it is only by accident that they are discovered. The birds have been known to return to the same spot season after season to breed. They will also breed fairly readily in captivity, and make interesting and useful pets in a semi-domesticated state. There is at least one record of a captive bird living for over 29 years.

The accompanying illustrations were taken at the Zoological Gardens, Adelaide, and show a pair of old birds with two young ones which were hatched in the aviaries which are in the care of Mr. Herbert Manfield, the head keeper. The first egg was laid on October 9, 1940, and the second two days later; the young were hatched on October 31, 1940. In eleven weeks (January 18, 1941) they were indistinguishable from the old birds. The South Australian Museum has a 16 mm. film record of the actions and antics of these birds at this time, which shows the defensive attitudes of the old birds (see bottom righthand picture herewith). The neck is extended forward, wings are widely outstretched, and the bird is poised on its toes in a most ferocious attitude. Occasionally they would make vicious swoops at the photographer, feathers bristling, while at other times they would remain crouched on the ground as shown in the picture on the bottom lefthand side. These birds are totally protected by law in South Australia, and it is necessary to obtain a permit from the Chief Inspector of Fisheries and Game in order to keep them.

A List Of Plants Collected In The Musgrave And Mann Ranges, South Australia, 1933

By

NORMAN B. TINDALE, B.Sc.

This brief paper records native plants, including many of economic importance to the aborigines, which were obtained during the Anthropological Expedition to the Mann Range in May to July, 1933. Brief notes on the names are given and uses are detailed of some of them. Further items can best be supplied in a general survey of the life of Pitjandjara tribes-people. Where separate names are given for plants in eastern and western dialects they refer respectively to the Jangkundjara and Pitjandjara tribes. In other cases the names are common to both groups.

The collection of plants was presented, in February, 1940, to the then newly formed South Australian Museum Botanical Collection. Examples of some of the rarer species have been lodged also in the herbarium of the University of Adelaide.

I am indebted to Dr. C. Hackett for companionship on this trip and to Mr. J. M. Black and Miss C. Eardley, who kindly identified the plants. One or two may be new records for this State. Further details of the itinerary of the expedition may be obtained in Oceania, IV, 1933, pp. 101-105, but in that account, owing to an editorial alteration, the native tribal names are wrongly spelled, a "z" being substituted for "dj." Several other typographical errors occur in that account and the places called Itjarano and Karapandi should be read respectively as Itjarango and Konapandi.

GYMNOSPERMS.

CUPRESSACEAE.

Callitris glauca, R.Br. Camp 9. Pital, between Musgrave and Mann Ranges, on granite rocks. Native name, kuli. June 30th.

Also S. slopes of Mt. Woodroffe, Musgrave Ranges. June 15th.

ANGIOSPERMS.

GRAMINEAE.

Themeda triandra, Forsk. (Kangaroo Grass). Camp 9. Pital, a small granite range between Musgrave and Mann Ranges. In crevices on southern slopes of granite. June 30th.

Tragus racemosus, (L.), Haller. (Small Burr Grass). 2 miles west of Erliwanjawanja. June 21st.

Aristida echinata v. *nitidula*, Henr. Camp 9. Pital, between Musgrave and Mann Ranges, on granite. June 30th.

Eriachne scleranthoides, F.v.M. Camp 9. Pital, between Musgrave and Mann Ranges. Crevices on southern slopes of granite range. June 30th.

Pappophorum avenaceum, Lindl. Camp 18. Kunamata, west of Mt. Kintore; on granite slope of hill. July 16th.

P. nigricans, R.Br. (Black Heads). Camp 9. Pital, between Musgrave and Mann Ranges; on granite. June 30th.

Triraphis mollis, R.Br. Two miles west of Camp 3. Erliwanjawanja, south side Musgrave Range. June 21st.

Also Camp 18, sandy slope north of granite range. July 16th.

Also two miles west of Erliwanjawanja. June 21st.

Triodia aristata, J. M. Black (Porcupine Grass). Camp 18, in crevices of rocks on northern slope of Kunamata (granite). July 16th.

Triodia sp. (Porcupine Grass). Beside claypan between Penandi (Mt. Harriet) and Konapandi (Musgrave Range). June 29th. "Giant Porcupine," flower unobtainable. Severity of injuries caused by the spikes causes camels to cry out in pain.

CASUARINACEAE.

Casuarina Decaisneana, F.v.M. (Desert Oak). East of Camp 9. Plain between Musgrave and Mann Ranges. June 29th.

PROTEACEAE.

Hakea lorea, R.Br. (Cork Bark Tree). Camp 18. July 16.

H. multilineata, Meisn. Camp 17. Mallee and porcupine plain, a low shrub. Native name, ultukun; scale insects on it produce a "wama" or sugar, used as food. July 15th.

Grevillea nematophylla, F.v.M. Camp 23. On porcupine-grass clad sand-dunes, as shrubs, 5 feet. Native name, ultukun. July 23rd.

G. stenobotrya, F.v.M. South of Camp 23. On crest of sand-dune; shrub 10 ft. Native name, endeilba. July 23rd.

MORACEAE.

Ficus platypoda, A. Cunn. (Native Fig). Camp 19. Growing on granite slopes at sacred totemic spot of the ili totem. Native name, ili. Fruits provide an important article of diet in early summer. July 17th.

SANTALACEAE.

Exocarpus sparteae, R.Br. Five miles south of Camp 23, in sandhills. July 23rd.

Eucarya sp. Camp 21. On granite slopes. Native name, kombalba. July 19th.

E. acuminata (R.Br.), Spr. Summ. (Native Peach). Camp 9. Native name, koparta = kabarda; fruit eaten. June 29th.

Also northern slopes of Mt. Kintore, S.A. July 17th.

E. ? (sp. indeterminable), Ernabella. Native name, koparta. Fruit eaten. June 7th.

Santalum lanceolatum, R.Br. Camp 4. Native name, koparta; an important native fruit. June 21st.

Also between Camps 8 and 9. June 29th.

LORANTHACEAE.

Loranthus gibberulus, Tate (mistletoe). Camp 16. Parasitic on "corkwood." July 14th.

L. Maidenii, Blakeley. Parasitic on spiny acacia (q.v.) = *Acacia tetragonophylla*. July 16th.

AMARANTACEAE.

Amarantus Mitchellii, Benth. Two miles west of Camp 3. June 21st.

Also Camp 5. June 26th.

Also Camp 9, on granite hill. June 30th. *Trichinium exaltatum* (Nees), Benth. Camp 9. Native name, kalpi pila; lit. "sandhill wings." June 30th.

NYCTAGINACEAE.

Boerhavia diffusa, L. Camp 18. Native name, uruba. This is a sticky plant, and is used as a tangle-foot to trap small birds. It is spread around waterholes. July 16th.

Also Camp 14.

PHYTOLACCACEAE.

Gyrostemon ramulosus, Desf. (Native Pepper). Sandhills on northern side of Mt. Kintore. Native name, kurumaru. Not used by natives. July 17th.

Codonocarpus cotinifolius (Desf.) F.v.M. (Native Poplar). Near Camp 18, two miles north of Kunamata, on moving sand dune; dense grove. The dead trees are uprooted by natives in search of grubs. Native name, kaludi. July 16th.

CRUCIFERAE.

Lepidium rotundum, D.C. Mt. Kintore, between granite boulders. July 17th.

PITTOSPORACEAE.

Pittosporum phillyreoides, D.C. Flowering. Camp 11. Native name, kombalba. July 13th.

Also Camp 15 (fruit half-ripe). July 13th.

Also two miles west of Camp 3. Native name, kombalji, kombalba, not eaten (fruit ripe). Also Camp 5 (flowers and ripe fruit), bushy shrub, six to twelve feet. Camels are very fond of it. June 26th.

Also Camp 10 (flowering). July 1st. Camp 16 (flowering). July 14th.

Ernabella (fruit ripe). Native name, kombalba; the fruits are considered poisonous. June 4th.

LEGUMINOSAE.

Acacia aneura or *brachystachya* (pods absent), (Mulga). Camp 21. Along dry creek beds. July 19th.

A. stronglyphylla, F.v.M. Camp 18, on northern slopes of granite hill. July 16th.

Also Camp 21. Native name, ngatun = ngatunba. July 19th.

A. brachystachya, Benth. (Umbrella Mulga), young pods. July 19th.

A. dictyophleba, F.v.M. Near Camp 18, two miles north-west of Kunamata, on sandhills with poplar and tea-tree. July 16th.

eaten as a "konakandi," i.e., a native damper or bread. July 19th.

At Atadjara on sand-slopes at foot of a granite hill, three miles west of Camp 21. July 19th.

Acacia ligulata, A. Cunn., (Umbrella Bush). Camp 18, Acacia scrub, one mile north of foot of Kunamata. July 16th.

Cassia eremophila, A. Cunn. Camp 10. Native name, enondji. Strong, sweet smell liked by aborigines, who wear the flowers in their head bands. June 30th. Also at Camp 14 (fruiting). Native name, enondji (western dialect) = undunu (eastern dialect). July 6th.



Woman preparing seeds of kurrajong; desert south of Mann Range.

Also east of Camp 9. June 29th.

A. tetragonophylla, F.v.M. (Dead Finish). Camp 9. Native name, kurara. June 30th.

Also Camp 18, see also mistletoe (*Loranthus Maidenii*). July 16th.

A. notabilis, F.v.M. Camp 21. Native name, itawara. Seeds ground up and

Psoralea patens, Lindl. Camp 10. July 1st.

Crotalaria Cunninghamii, R.Br., Bird Flower. Camp 18. Shrub six feet high, in acacia scrub, rare, never previously noticed by aboriginal followers. July 16th.

Swainsona Burkei, F.v.M. Two miles west of Erliwanjawanja. June 21st.

GERANIACEAE.

Erodium cygnorum, Nees. Native name, malu pumpunju = pital pital. Two miles west of Erliwanjawanja. Purple flower. June 21st.

EUPHORBIACEAE.

Euphorbia eremophila, A. Cunn. Camp 18. July 16th.

E. Drummondii, Boiss., manka manka, a poisonous plant; not used by natives. Two miles west of Erliwanjawanja. June 21st.

Adriana Hookeri, (F.v.M.), Muell. Arg. Camp 21, on sand slopes on northern side of Mount. July 19th.

SAPINDACEAE.

Dodonaea attenuata, A. Cunn. Camp 19. Native name, tjenein, tjeneinba. Shrub on mulga plain; not used by natives. July 18th.

Dodonaea petiolaris, F.v.M. Northern slope of Mt. Kintore, on granite rocks. July 17th.

MALVACEAE.

Sida virgata, Hook. var. *phaeotricha* (F.v.M.), Benth. Camp 18, on granite slopes of Kunamata. July 16th.

Abutilon leucopetalum, F.v.M. (with diseased flowers), tjeirintjeirin, Ernabella; "not eaten; children make small play spears with it." June 17th.

STERCULIACEAE.

Brachychiton Gregorii, F.v.M. (Desert Kurrajong). Between Camps 16 and 17. Mallee and porcupine plain, each tree growing from heart of mallee clump. Native name, ngalta, ngaltatjiti. Seeds (tjiti) are an important food. July 15th.

Also Between Camp 24 and 25, in limestone country associated with mallee and porcupine. Native name, ngalta. The seeds, deposited with the dung of crows on granite rock surfaces bearing water holes, constitute an acceptable source of supply of grain which is milled on the rocks and made into native bread. The accompanying illustration shows the preparation of this food, provided by the crow, in the desert south of the Mann Range. July 26th.

MYRTACEAE.

Eucalyptus oleosa, F.v.M. (Red Mallee). Owalina Soak, Musgrave Range. June 16th.

Prob. *E. dichromophloia*, F.v.M. Camp 9. Native name, itara. On sandy flat near southern side of granite range. June 30th.

Also Camp 16 (fruiting). July 14th.

E. intertexta, R.T.B. (Red Box). Camp 23, on flat beside creek. July 24th.

Also fruits from Owalina Soak, Musgrave Range. June 16th.

E. Ewartiana, Maiden. Camp 17. Mallee and porcupine plain, fruiting. July 15th.

Also east of Camp 9, on plain between Musgrave and Mann Ranges (fruiting). June 29th.

E. ? rostrata, but of a mallee habit. Tindale questions *E. rostrata* identification. Camp 17, mallee and porcupine plain. July 15th.

E. rostrata, Schlecht. (Red Gum). Camp 5, growing in creek bed (fruiting). June 25th.

Thryptomene Maisonneuvii, F.v.M. East of Camp 9, on crests of sandhills. Honey dew is gathered from the flowers at dawn. Native name, wapiiti. June 29th.

ASCLEPIADACEAE.

Sarcostemma australe, R.Br. (Milk Bush). Camp 26. Native name, ipi-ipi, diminutive of ipi = milk = breast. Used as white decorative spots on skin and as medicine to cure sores on hands (fruiting). July 28th.

Pentatropis Kempeana, F.v.M. Ernabella, Musgrave Range. Creeper; leaves, stems, flowers and roots eaten raw, also cooked. Native name, puji. June 7th.

VERBENACEAE.

Newcastlia cephalantha, F.v.M. Four miles north-west of Camp 18, on sand-hills with "tea-tree." July 16th.

Also at Mt. Kintore. July 17th.

SOLANACEAE.

Nicotiana excelsior, J. M. Black (Giant Tobacco). Camp 14. Native name, mingurpa, true native tobacco as chewed in Mann Range. White flower, purplish on outer part. July 11th. Chewed green or after steaming over fire for five to six minutes.

Solanum petrophilum, F.v.M. Camp 5. Purple flower, no edible fruit (prickly). June 26th.

S. ellipticum, R.Br. Camp 5. Native name, koilpuru (western dialect); jurarupa (eastern dialect). Green fruit half inch diameter; sweet, tomato-like flavor; much eaten by natives. June 25th.

Also Camp 9, on granite slopes. Native name, jurarupa = koilpuru. An edible fruit. June 30th.

BIGNONIACEAE.

Tecoma doratoxylon, J. M. Black (Spearwood Bush), Ernabella. Native name, urutjan. Used for making a big spear employed when hunting rabbits. Flowers and dried seeds. June 7th.

Also Camp 21, in crevices in granite. July 19th.

MYOPORACEAE.

Eremophila serrulata (A. Cunn.) Druce. Camp 9, granite hill. June 30th.

Also Camp 21. July 19th.

Eremophila longifolia (R.Br.), F.v.M. Camp 18. On sand slope north of granite range. July 16th.

E. Latrobei, F.v.M. Mt. Woodroffe, valley flats at 2,500 feet. June 15th.

Also Camp 21. On red soil plain. July 19th.

Also Atadjara, three miles west of Mt. Crombie. July 19th.

Also Camp 16. July 15th.

RUBIACEAE.

Plectronia latifolia (F.v.M.) Benth. et Hook. Camp 16. July 14th.

COMPOSITAE.

Myriocephalus Stuartii (F.v.M. et Sond.) Benth. Two miles west of Camp 3. On sand-dune where rain showers had recently fallen. June 21st.

Also Camp 18. On sandy slope north of granite range. July 16th.

Calotis hispidula, F.v.M. (the Bogan Flea). Two miles west of Erliwanjanja. June 21st.

Olearia Ferresii, F.v.M. Camp 23 on granite rocks. July 24th.

Pterocaulon sphacelatum (Labill.) Benth. et Hook. Camp 10. On porcupine grass flat, gneissic rock. July 1st. *Senecio Gregorii*, F.v.M. Camp 18. On sandy slope north of granite range. July 7th.

Wedelia Stirlingii, Camp 21. July 19th.

Not Identified.—Fleshy roots. West of Camp 11, on sandhills. Native name, warin-gura, tjutirangu. July 4th.

Additional Plant Records For National Park, Morialta, And Waterfall Gully Reserves

By

J. B. CLELAND.

In the "S.A. Naturalist," Vol. XVII, pages 112-127, 1936, a list is given of the plants till then identified in the above Reserves. Since then, a number of additional records, included in this paper, have been obtained. The mark x indicates that the species concerned is a new record for any of the three Reserves, and an asterisk (*) that the species is an introduced one. Previous records for the Reserves are indicated by M., W.G., or N.P. I am indebted to Mr. J. M. Black for many identifications, and to Mr. S. T. Blake for reviewing the Cyperaceae. A total of 575 species, and three varieties in addition, are now known for these Reserves, of which 402 are native species and 173 are introduced.

NATIONAL PARK.

GRAMINEAE:—**Ehrharta longiflora* Sm.,
M. W.G.

Amphipogon strictus R.Br. M.

x*Stipa aristiglumis* F.v.M. (Nov.)

Eragrostis Brownii Nees. M.

**Festuca rigida* (L.) Kunth. M. W.G.

Cynodon dactylon Rich. M. W.G.

x**Hordeum murinum* L., Barley-grass.

CYPERACEAE:—*Scirpus inundatus* (R.Br.)
Poir. W.G.

x*Lepidosperma carphoides* F.v.M. M.

x*Carex inversa* R.Br.

x*C. chlorantha* R.Br.

C. sp., probably distinct from *C. pumila*
Thunb. (which should be deleted).

x*C. sp.* near *C. Blakei* Nelmcs.

x*C. hebes* Nelmcs.

JUNCACEAE:—*Juncus polyanthemus* Buch.,
M. W.G.

AMARYLLIDACEAE:—x*Hypoxis pusilla*
Hook. f. (Oct.).

IRIDACEAE:—**Romulea rosea* (L.) Eckl.,
M. (Oct.)

LORANTHACEAE:—*Loranthus Miquelii* on
Argyle Apple (*Eucalyptus cinerea*
F.v.M., planted).

L. pendulus was found growing on
Eucalyptus obliqua, with two trees of
E. leucoxylon, one on each side, with *L.*
Miquelii on them.

POLYGONACEAE:—x**Rumex pulcher* L.,
Fiddle Dock.

CHENOPODIACEAE:—x*Chenopodium cari-*
natum R.Br., Keeled Goosefoot (May).

AMARANTACEAE:—x**Amarantus patulus*
Bertol.

CARYOPHYLLACEAE:—*Polycarpon tetra-*
phyllum Loebl. M. W.G.
x**Silene nocturna* L.

RANUNCULACEAE:—x*Ranunculus tricho-*
phyllus Chaix, Water Buttercup, at the
Railway Dam, Dec., 1939.

PAPAVERACEAE:—x**Fumaria parviflora*
Lamk.

CRUCIFERAE:—**Sisymbrium orientale* L.,
Wild Mustard. W.G.

x**Capsella bursa-pastoris* (L.) Moench.,
Shepherd's Purse.

x**Coronopus didymus* (L.) Sm.

LEGUMINOSAE:—x**Medicago confinis*
Koch.

Psoralea patens Lindl., M., W.G.

x**Vicia sativa* L. var. *angustifolia*
Wahlbg.

x**V. hirsuta* (L.) S. F. Gray.

x*Glycine Latrobeana* (Meisn.) Benth.
(Oct.).

GERANIACEAE:—*Pelargonium australe*
Willd. var. *erodioides* Benth. M. W.G.

MYRTACEAE:—*Eucalyptus viminalis* grows in the National Park on the lower slopes of the gullies as a tall tree with rough bark up to the branches, or smooth nearly to the base, the fruits in threes and fours, apparently no more, and usually in threes or less. This appears to be *E. Huberiana* Naudin.

OENOTHERACEAE:—**Oenothera odorata* Jacq., Evening Primrose, railway line, beyond Long Gully (Nov.). M.

HALORRHAGIDACEAE:— x*Halorrhagis elata* A. Cunn. (?).

UMBELLIFERAE:—*Hydrocotyle laxiflora* DC. M. W.G.
x**Torilis nodosa* (L.) Gaertn. One plant after the fire of Jan., 1939.

EPACRIDACEAE:—x*Leucopogon virgatus* (Labill.) R.Br.

VERBENACEAE:—**Verbena bonariensis* L. M.

LABIATAE:—x**Stachys arvensis* L., Hedge-nettle.

SOLANACEAE:—*Solanum aviculare* Forst. f., Kangaroo Apple. Three seedlings after the fire of Jan., 1939. W.G.

RUBIACEAE:—*Asperula scoparia* Hook. f. (?) M. (Nov.).
x**Galium divaricatum* Lambk.

CAMPANULACEAE:—*Wahlenbergia Sieberi* A.DC. M. W.G.
W. quadrifida (R.Br.) A.DC. M. W.G.

STYLIDIACEAE:—*Stylidium graminifolium* Swartz, after the fire of Jan., 1939. M. W.G.

COMPOSITAE:—x*Lagenophora stipitata* (Labill.) Druce.
x*Brachycome perpusilla* (Steetz) J. M. Black (Oct.).
x*Olearia glutinosa* (Lindl.) Benth.
x**Anthemis nobilis* L., Common Chamomile.

x*Erechtites picridioides* Turcz., (Oct., Dec.) (?).

x*Helichrysum retusum* Sond. et F.v.M., Sturt Road, beside the Park.

Ixodia achilleoides R.Br. M. W.G.

x**Picris echioides* L., Ox-tongue. [Probably the record for the three reserves of *P. hieracioides* is a mistake for this species.]

FUNGI:—*Brachypodium distachyum* (Gramineae) with smut. *Carex* sp. (Cyperaceae) with rust, April, 1937.

Tricoryne elatior (Liliaceae) with rust.

MORIALTA.

IRIDACEAE:—*Romulea Columnae* Seh. et M. W.G. N.P.

ORCHIDACEAE:—*Corysanthes* sp.
Pterostylis robusta Rogers. N.P.

LORANTHACEAE:—*Loranthus Miquelii* on *Eucalyptus rostrata* (new host).
L. Exocarpi on *Acacia Baileyana* F.v.M. (new host).

RANUNCULACEAE.—*Ranunculus parviflorus* L. W.G. N.P.

BORRAGINACEAE:—x**Heliotropium amplexicaule* Vahl (= *Cochranea anchusifolia* (Poir.) Gurke. (March).

WATERFALL GULLY.

GRAMINEAE:—*Danthonia semiannularis* (Labill.) R.Br. M. N.P.

CYPERACEAE:—x*Schoenus foliatus* (Hook. f.) S. T. Blake.
Eleocharis gracilis R.Br., for *Heleocharis multicaulis*.
Carex breviculmis R.Br.?, abnormal.
C. fascicularis Brott., for *C. pseudocyperus* L.

LILIACEAE:—*Lomandra caespitosa* (Benth.) Ewart. M.

LORANTHACEAE:—*Loranthus Miquelii* on *Eucalyptus cosmophylla* (new host).

Plants Of The Encounter Bay District

Fifth List Of Additional Records

By

J. M. BLACK AND J. B. CLELAND.

We published a fourth list of additional records in the "South Australian Naturalist" for March 24, 1937 (Vol. XVI, No. 4, p. 52). With the additions in this list, the number of species now recorded for this district, extending from the road to Tunkalilla Beach in the west to Currency Creek in the east, is 878, together with 20 varieties in addition, of which 674 species and 17 varieties in addition are native plants and 204 species and three varieties in addition are introduced.

† Indicates a new record. * An introduced species.

LYCOPODIACEAE:—†*Lycopodium carolinianum* L., creek above Reservoir Dam in Hindmarsh Valley, Jan., 1937.

POTAMOGETONACEAE:—*Posidonia australis* Hook f., already recorded. Numerous fruits washed up at Encounter Bay in the first week of January, 1940.

GRAMINEAE:—*Andropogon halepensis* (L.) Sibth., Johnson Grass, already recorded, in gardens at Victor Harbour.

†*Echinochloa crus-galli* (L.) Beauv. *Panicum effusum* R.Br., already recorded for Back Valley, was abundant (spent heads) near the oval by the Inman River in May, 1939.

Ehrharta longiflora Sm., already recorded, is now common in Victor Harbour.

**Phalaris tuberosa* L. (?), planted in cleared ground on the ridges between Back Valley and the Waitpinga Road, and appearing sporadically around.

†**Anthoxanthum odoratum* L., Back Valley, Oct.

†*Stipa acrociliata* Reader, in scrub under bushes, etc., near Goolwa, Nov., 1935.

S. tenuiglumis Hughes, already recorded, near Goolwa, Nov.

†*S. elatior* Hughes, Encounter Bay (in Black's Flora).

†*S. aristiglumis* F.v.M.

†*S. bigeniculata* Hughes, Encounter Bay, Jan.

†*Sporobolus indicus* R.Br., Victor Harbour, Port Elliot.

Danthonia semiannularis (Labill.) R.Br., instead of *D. penicillata*. In Callistemon swamp near Encounter Bay; near Goolwa, Nov.

†*D. setacea* R.Br., in swampy soil, Back Valley.

D. auriculata J. M. Black, instead of *D. carphoides*.

**Bromus villosus* Forsk., instead of *B. maximus*.

†**B. madritensis* L., Madrid Brome.

†**B. arenarius* Labill., Sand Brome, Encounter Bay.

CYPERACEAE:—*Cyperus sanguinolentus* Vahl, for *C. Eragrostis*.

†*C. gymnocaulos* Steud., Encounter B., w. of Bluff, heads after bending over rooting with a crop of young plants.

†*Schoenus foliatus* (Hook. f.) S. T. Blake (= *S. axillaris* in Black's Flora), Back Valley, Oct.

†*S. nitens* (R.Br.) Poir., Back Valley. *S. tenuissimus* (Hook. f.) Benth., already recorded, also Upper Willow Creek.

†*Scirpus fluitans* L., var. *terrestris* F.v.M., Upper Hindmarsh Valley.

†*S. lenticularis*, in Callistemon swamp near Bluff, Nov., 1935.

†*S. stellatus* C. B. Clarke, in Callistemon swamp near Bluff.

Cladium articulatum R.Br., reported for Black Swamp, also swamps at Goolwa and Encounter Bay.

†*Cladium laxum* (Nees) Benth., vel. sp. aff., Back Valley.

RESTIONACEAE:—*Lepyrodia Muelleri* Benth., Back Valley.

LILIACEAE:—*Lomandra micrantha* (Endl.) Ewart instead of *L. multiflora* (in error) recorded, in flower in May at Hall's Creek.

†*L. caespitosa* (Benth.) Ewart, Mt. Robinson, above Upper Willow Creek (edges of leaves very finely serrated).

**Allium vineale* L., Crow Garlic. This is the species (already recorded) which is spreading near the Inman Mouth.

†**A. rotundum* L., Round-headed Garlic, a few plants in paddocks at Encounter Bay.

Asparagus medeoloides Thunb., a number of plants well established in the scrub on the Currency Creek-Goolwa Road, November.

Xanthorrhoea australis R.Br., recorded by J. M. Black (Trs. Roy. Soc., S.A., Vol. 63, 1939, p. 243, for Waitpinga).

ORCHIDACEAE:—*Thelymitra grandiflora* Fitz., Goolwa (in Black's Flora).

†*T. Macmillanii* F.v.M., Goolwa (in Black's Flora).

†*Microtis oblongata* Rogers, Victor Harbour (in Black's Flora, Part IV).

†*Diuris palustris* Lindl., Goolwa (in Black's Flora).

The following five orchids, already recorded, were in flower in Upper Willow Creek in Jan., 1940:—*Microtis porrifolia*, *M. atrata*, *Prasophyllum australe*, *Orthoceras strictum* and *Cryptostylis longifolia*.

LORANTHACEAE:—*Loranthus pendulus* Sieb., already recorded, on *Eucalyptus viminalis* (*E. Huberiana*), Hindmarsh Valley.

CHENOPODIACEAE:—*Atriplex patulum* L., already recorded, appeared in great abundance along the strand from the Bluff to Victor Harbour in December, 1940, a few plants having been noticed near the Bluff previously.

†*Kochia oppositifolia* F.v.M., Goolwa.

Arthrocnemum halocnemoides Nees var. *pergranulatum* J. M. Black, Goolwa, near Port Elliot.

AMARANTACEAE:—†*Hemichroa pentandra* R.Br., in salt-marsh, Goolwa, flowering in Dec.

CRUCIFERAE:—**Diplotaxis muralis* (L.) DC. should be var. *Babingtonii* Syme.

†**Alyssum maritimum* (L.) Lamk. The florist's Sweet Alyssum is a garden

escape at Port Elliot (May, 1940).

†**Capsella Bursa-pastoris* (L.) Moench., Shepherd's Purse, Goolwa.

ROSACEAE:—**Poterium sanguisorba* L., Sheep's Burnet, already recorded for Goolwa, Victor Harbour.

LEGUMINOSAE:—*Pultenaea densifolia* F.v.M., already recorded, near Goolwa, Nov.

RUTACEAE:—†*Zieria veronica* F.v.M., in sand on ridge behind Victor Harbour.

†*Phebalium pungens* (Lindl.) Benth., scrub along railway line near Goolwa, identified by Miss Eardley in early bud, Oct.

EURPHORBIACEAE:—†**Euphorbia terracina* L., Encounter Bay, Aug.

†*Micrantheum demissum* F.v.M., occurs on the Adelaide side of the Cut Hill on the main road.

MALVACEAE:—†**Modiola caroliniana* (L.) G. Don., roadside, Encounter Bay, Jan.

MYRTACEAE:—*Melaleuca decussata* R.Br., var. *ovoidea* J. M. Black, recorded in Black's Flora for Encounter Bay and Goolwa.

Eucalyptus Huberiana Naudin is apparently the form of *E. viminalis* in this district. In flower, Hindmarsh Valley, March, 1939.

The following flowering dates of Eucalypts have been noted:—

E. diversifolia, 19/8/40; *E. Baxteri*, 20/1/40; *E. rostrata*, 30/12/40; *E. angulosa*, 20/1/40; *E. calycogona*, Goolwa, 20/8/40; *E. fasciculosa*, Goolwa, 8/1/40, Encounter Bay, 16/8/40.

EPACRIDACEAE:—*Leucopogon Clelandii* Cheel, already recorded, also near Goolwa.

ACROTRICHE sp., near *A. divaricata* R.Br. and *A. aggregata* R.Br., though probably only a long-leaved variety of *A. affinis*, in bud, Goolwa, Nov., 1935.

CONVOLVULACEAE:—†**Convolvulus larvensis*, L., Lesser Bindweed, Victor Harbour, Port Elliot.

†*Wilsonia humilis* R.Br., salt swamps near Goolwa.

LABIATAE:—*Lavendula Stoechas* L., already recorded, also Hall's Creek.

SOLANACEAE:—*Nicotiana maritima*
Wheeler, replaces *N. suaveolens*.

CAMPANULACEAE:—†*Wahlenbergia vinciflora* (Vent.) Decaisne, Mt. Robinson, Cut Hill, near Goolwa (Nov.).
†*W. quadrifida* (R.Br.) A.DC., Back Valley.

GOODENIACEAE:—†*Dampiera rosmarinifolia* Schl., is now definitely recorded for the railway line between Currency Creek and Goolwa.

STYLIDIACEAE:—†*Stylidium perpusillum* Hook f., in Black's Flora.

COMPOSITAE:—*Lagenophora stipitata* (Labill.) Druce, already recorded, also Hindmarsh Tiers.

†*L. Huegelii* Benth., Hall's Creek.

Brachycome perpusilla (Steetz) J. M. Black replaces *B. collina*.

†*Vittadinia megacephala* (F.v.M.) J. M. Black, Goolwa.

Olearia ramulosa var. *microphylla* (—*O. ramulosa*) and *O. revoluta* var. *minor* (= *O. ramulosa*) should be deleted.

†*Erechtites hispidula* (A. Rich.) D.C., near Goolwa, Nov.

Cassinia laevis R.Br., recorded in Black (but should be confirmed as it may refer to *C. complanata*), replaces the record of *C. aculeata*.

Helipterum demissum (A Gray) Druce replaces *H. exiguum*.

Helichrysum decurrens F.v.M., Goolwa.

**Cirsium Acarna* (L.) Moench., Soldier Thistle, already recorded, Goolwa, June.

†**Onopordon acaule* L., Stemless Onopordon, Goolwa, Dec.

**Carthamus lanatus* L., recorded for Goolwa, Encounter Bay, Feb.

**Scorzonera laciniata* L., already recorded, near Goolwa, Nov.

†**Picris echioides* L., Ox-tongue, near Goolwa, Nov.

†**Sonchus asper* Hill.

Fresh Water Snails From The River Torrens

By

BERNARD C. COTTON and A. K. BEASLEY

Difficulty has been experienced in naming the various species of shells taken from the River Torrens. The following notes are based on the examination of some hundreds of specimens taken from the river at Marden, Payneham, South Australia.

AMERIANNA TENUISTRIATA SOWERBY, 1873.

This is the commonest and most variable species in the Torrens, the type locality. There appear to be four distinct forms.

(a) Typical. Shell blackish green in life, brown to yellow in the dead shell; spiral striae marked, visible to the naked eye. Animal dark grey, tentacles long, whitish at the base, elsewhere black.

(b) Variety "*texturatus* Sowerby," type locality "South Australia." Shell thicker, axial sculpture more pronounced than the spiral. Animal similar to that of "*A. tenuistriata*." This variety was figured under the name of "*A. bullata*" in this publication, vol. 13, no. 4, p. 161, pl. 2, fig. 9, August, 1932.

(c) Shell thick, spiral striae faint, odd yellow and brown, axial color bands.

(d) Shell very thin, amber coloured, spiral striae obsolete. Animal red. Although this variety is placed under *A. tenuistriata* its true relationship is doubtful.

Amerianna subacuta sp. nov.

Shell dark green in life, dark brown or yellow when dead; medium thickness; axials fine and regular, no spiral striae; body and spire long, spire a little longer than the body whorl and acute. Animal dark grey, tentacles long and white. Holotype. Shell length, 18 mm., width 7 mm.; Marden, River Torrens, South Australia (Reg. No. D.14081, S.A. Mus.). Formerly misidentified as *A. pyramidata* (type locality, Flinders Island, Bass Straits), *subacuta* was figured under that name in this publication, vol. 13, no. 4, p. 161, pl. 2, fig. 8, August, 1932. The Victorian species, *A. acutispira* and *A. producta*, seem somewhat similar in shape.

The Field Naturalists' Section

EXCURSIONS

1941.			
May 10—Waterfall Gully.	Tram, 1.30 p.m.	Botany	Mr. E. H. Ising
17—Henley South.	Tram, 1.30 p.m.	Pond Life	Mr. W. M. Nielsen
31—Semaphore to Grange.	Train, 1.10 p.m.	Bryozoa	Mr. F. K. Godfrey
June 7—Glen Osmond.	Tram, 2 p.m.	Waite Research	Prof. J. A. Prescott
14—Outer Harbor.	Train, 1.10 p.m.	Marine Life	Mr. B. C. Cotton
28—Teachers' College.	Gates, 2 p.m.	Nature Study	Mr. J. E. Machell
July 12—University.	Gates, 2 p.m.	Tate Museum	Dr. A. R. Alderman
26—Henley to Grange.	Tram, 1.30 p.m.	Shells	Mr. W. G. Tucker
Aug. 2—Ethelton.	Train, 1.10 p.m.	Botany	Prof. J. B. Cleland
9—Port Willunga (3/-).	Motor, 1.30 p.m.	Shells	Mr. F. K. Godfrey
23—Semaphore to Fort Largs.	Train, 1.10 p.m.	Shore Life	Mr. B. C. Cotton
30—Fulham.	Tram, 1.30 p.m.	Bird Life	Capt. S. A. White

TRAM EXCURSIONS.—Meet in Grenfell Street, by T. & G. Building.

TRAIN EXCURSIONS.—Will members obtain their tickets and meet on the train.

MOTOR EXCURSIONS.—Meet at the Town Hall, Adelaide. Book with the Secretary or the Treasurer.

EVENING MEETINGS

1941.	1941.
Apr. 15—"Goodeneaceae" Dr. M. T. Winkler	June 17—"South Australian Lepidoptera" Mr. F. M. Angel
"Hills Flowers" Mr. W. D. Wade	"Orchid Studies" Mr. H. Goldsack
May 20—"South Australia and the Mineral World"	July 15—Malacological Society Evening
Dr. A. R. Alderman	Chairman Mr. W. G. Tucker
Aug. 19—Annual Meeting.	

Meet at the Royal Society Rooms, North Terrace.

MALACOLOGICAL SOCIETY: Evening Meetings

1941.	1941.
Mar. 3—"Trochidae" Mr. B. C. Cotton	June 2—"Marino Chitons" Rev. B. J. Weeding
17—"Land Snails" Mr. W. M. Nielsen	16—"Brachiopoda" Mr. W. G. Buick
April 7—"Shells Through the Ages"	July 7—"Naticidae" Mr. B. C. Cotton
Mrs. L. A. Elliott	21—"Fresh Water Snails" Mr. A. K. Beasley
21—"Hydrozoa" Mr. F. K. Godfrey	"Rissoidae" Mr. B. C. Cotton
May 5—"Turridae" Mr. B. C. Cotton	Aug. 4—Annual Meeting and Exhibits by members.
19—"Corals" Miss D. M. Matthews	18—"Patellidae, Lottiidae, Stomatellidae" Mr. B. C. Cotton

Meet at the South Australian Museum, North Terrace.



SOUTH AUSTRALIAN FEATHER CORALLINE
Stereotheca elongata.

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EUCALYPTS OF NATIONAL
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HYDRANTHS AND JELLY FISHES

By

BERNARD C. COTTON and FRANK K. GODFREY

Each of the major groups of the Animal Kingdom is termed a phylum, many authorities reckon twelve, counting from the lowest forms upwards. Unicellular organisms, example Foraminifera, constitute Phylum I. The Mollusca are well up the scale in Phylum XI. The life forms here considered rank in Phylum III, and especially that class or section termed *Hydrozoa*.

These lowly, but very interesting animals, are usually small. They have an internal cavity in which there is no separation between the enteric or digestive cavity, and the coelome or body cavity, just one continuous space representing both and opening only on the exterior by the mouth. In one stage of their life history they are called Zoophytes (Gr. *zoophuton*—an animal-plant), a term we prefer to-day to consider as plant-like-animals. In the other stage they are styled Medusae, better known as jelly-fishes.

Aristotle, in the fourth century B.C., began that systematic collection of knowledge which nowadays we call science. He sent out explorers to collect facts. He was the father of Natural History and wrote:—

“The second step Nature takes is from plants to plant-animals, *Zoophytes*. There are many creatures which leave the observer in doubt as to whether they are plants or animals, for they grow on the rocks, and many die if detached.”

The other term also is Greek. Medusa, in classical mythology, was one of the Gorgons who, giving offence to Minerva, had the fine hair, on which she prided herself, turned to serpents. We sometimes speak of jelly-fishes as sea-nettles, because of the ability possessed

by some of them to sting by means of trailing tentacles, hence the allusion.

A zoophyte, bearing the genus name *Obelia*, is found growing on seaweeds, rocks, and jetty piles, below low tide mark. The colour is whitish or light brown, and it is almost fur-like, consisting of branched filaments about the thickness of fine sewing cotton. Some of these filaments are closely adherent to the weed or timber, and serve for attachment, while others are given off at right angles, and present at intervals short lateral branches, each terminating in a bud-like enlargement. The whole structure is a zoophyte colony, consisting of a common stem on which are borne numerous *zooids*. The word zooid is from two Greek words (*zoon*—an animal; *eidos*—resemblance), and indicates an animal organism not independently developed from a fertilized ovum, but derived from a preceding individual by the process of fission or of budding.

The short lateral branches are mostly arranged in an alternate manner and bear the zooids at their ends. The large majority of the zooids have the form of little conical structures each enclosed in a glassy, cup-like investment or *hydrotheca* (of or belonging to *Hydra*, the typical genus of the class *Hydrozoa*; *theca*—a sheath), and produced distally into about twenty-four tentacles. These zooids are the *hydranths* (Gr. *hydra*, and *anthos*—a blossom) or *polyps*.

Less numerous and found chiefly towards the base of the colony, are long cylindrical bodies or *blastostyles* (Gr. *blastos*—a sprout; *stylus*—a pillar or post), each enclosed in a transparent case, the *gonotheca* (Gr. *gonos*—offspring, seed; *theca*—a sheath), and bearing numerous small lateral offshoots known as *medusa-buds*. Both blastostyles and medusa-buds are zooids, so the colony is trimorphic, having zooids of three kinds.

A hydranth is a somewhat cylindrical, hollow body, yellowish, and produced at its far end into a conical elevation, around the base of which are arranged the twenty-four tentacles in a circle. This hollow body opens out by the mouth, which is placed at the summit of the conical elevation in the midst of the tentacles. Small organisms may be caught by the tentacles and carried towards the mouth to be swallowed.

The hydrotheca is vase-shaped, transparent and colourless. When irritated the hydranth withdraws itself partly into the hydrotheca, and the tentacles become shortened and curved over.

The blastostyle has neither mouth nor tentacles, and ends distally in a flattened disc. The hydrotheca of a hydranth is here represented by the gonotheca, a cylindrical capsule enclosing the whole structure, but ultimately becoming ruptured at its distal end to allow the escape of the medusa-buds. These last are, in the young condition, mere hollow offshoots of the blastostyle. When fully developed they have the appearance of saucers attached by the middle of the convex surface to the blastostyle, produced at the edge into sixteen very short tentacles, and having a blunt process, the *manubrium* (Lat. —a handle, from *manus*—the hand), projecting from the concave surface like the handle of an umbrella. They are ultimately set free, through the aperture in the gonotheca, as little *medusae* or jelly-fishes.

The mouth of a medusa is at the free end of the manubrium or umbrella handle, and is four-sided. It leads into an enteric cavity which occupies the whole interior of the manubrium. From the dilated base of the latter, are sent off four delicate tubes, the *radial canals*, which pass at equal distances from each other through the substance of the umbrella to its margin, where they all open into a *circular canal*, running parallel with and close to the margin. By means of this system of canals, the food, taken in at the mouth and digested in the manubrium, is distributed to the entire medusa.

The edge of the umbrella gives off the tentacles, sixteen in the newly born medusa, and very numerous in the adult. At the bases of eight of the tentacles, two in each

quadrant, are globular sacs, each containing a calcareous particle. These are marginal sense organs and their function, probably, is to guide the medusa by imparting a sense of direction.

The various branches of the common stem of the fixed colony are formed of two layers: a transparent, tough, outer membrane, yellowish, and of a horny consistency, the *perisarc* (Gr. *perisarkos*—surrounded with flesh), and an inner, delicate, granular layer, the *coenosarc* (Gr. *koinos*—common; *sarx*—flesh), continuous with the body of each hydranth. The perisarc is but a cuticle, formed, layer by layer, as a secretion. It is composed of a substance of *chitinoid* and serves as a protective external skeleton. In the same way hydrothecae and gonothecae are cuticular products of the hydranths and blastostyles respectively. At the base of each zooid or branch the perisarc presents several annular constrictions, giving it a ringed appearance.

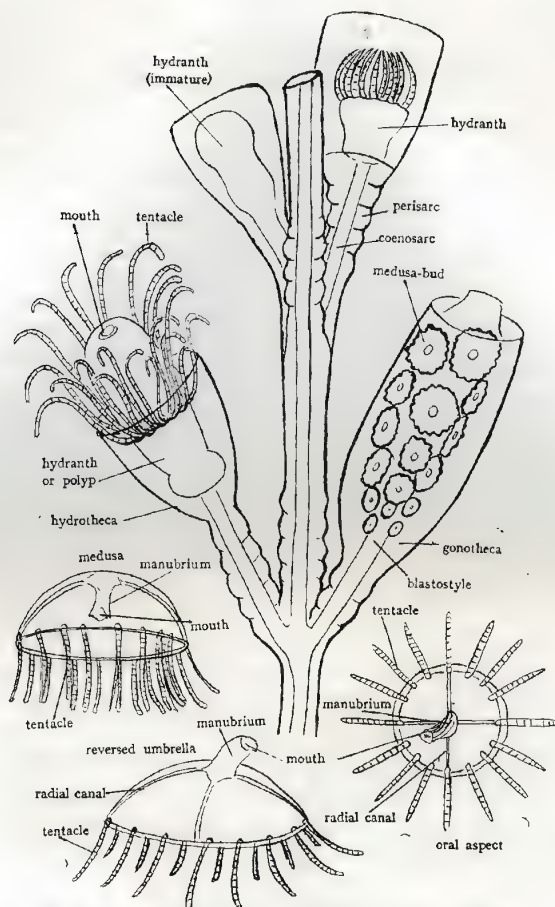
The hydranths, their tentacles, the coenosarc, the blastostyles and medusa-buds are all composed of two layers of cells, with a delicate, transparent membrane between them, the same being thus continuous through the entire zoophyte colony.

Embedded in the outer layer of cells are numerous clear ovoid bodies, the *stinging capsules* or *nematocysts* (Gr. *nematos*—a thread; *kustis*—a bag), serving as weapons of offence, and their minute barbs and poisonous threads exert a numbing effect on the tiny animals upon which the hydranth preys.

The zoophyte colony is a community of individuals run on the strictest of co-operative principles, in which the good fortune accruing to one of the hydranths by food falling in its way, is shared by all alike. A hydranth cannot digest it and retain it to its own selfish use, instead, it goes to the nutriment of the commonwealth.

The method of reproduction is noteworthy. In the fixed colony there are no sexual cells set apart for reproduction. Such are found only in the medusa and not in the colony.

Hanging from the umbrella, at equal distances, are four ovoid bodies (gonads), each enclosing a mass of cells, differentiated into



A Diagrammatic Figure of Obelia

ova or sperms. Each medusa is of one sex only, either male or female. When the gonads are ripe, the sperms of the male medusae are shed into the water and carried by currents to the females, impregnating the ova, which thus become oosperms or unicellular embryos. The oosperm undergoes complete segmentation and is converted into an ovoidal body called a *planula*. This swims free for a time, then settles down on weed, rock or timber, fixes itself and develops into a *hydrula* or simple polyp, having a disc of attachment at one end, and at the other a circle of tentacles. Soon the hydrula sends out lateral buds, and by a frequent repetition of this process, becomes converted

into the complex colony with which we started.

This remarkable life history is an example of *alternation of generations*, or *metagenesis* (Gr. *meta*—denoting change; *genesis*—origin, source, birth). The colony is sexless, having no gonads, and developing only by the asexual process of budding; but certain of its buds, the medusae, develop gonads, and from their impregnated eggs new colonies arise. We thus have an alternation of an asexual generation, the fixed zoophyte colony, with a sexual generation, the medusa or jelly-fish.



OBELIA GENICULATA.



HALICORNOPSIS ELEGANS.



SCHIZOTRICHA BUSKI.



PLUMULARIA COMPRESSA.



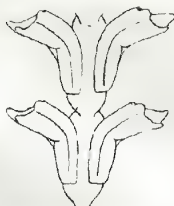
AGLAOPHENIA DIVARICATA.



AGLAOPHENIA PLUMOSA.



STEREOTHECA ELONGATA



DIPHASIA SUBCARINATA



SERTULARIA OPERCULATA



SERTULARIA MINIMA.



SERTULARELLA INDIVISA.



SERTULARELLA NEGLECTA.

SOME COMMON HYDROIDS OF SOUTH AUSTRALIA.

At Marino, and some other beaches, the tides have thrown up a sand ridge which holds back a quantity of water when the tide retires. Here, in this shallow sea pond, is seen a quantity of brown weed, the long narrow leaves of the submarine plant *Posidonia australis* Hook. A little close attention will reveal feather-like structures, a few inches in length, floating free or attached by one end to other marine objects,

such as sponges or sea-plants. Here we have another zoophyte colony, a community of individuals, bearing the name *Stereotheca elongata* Lamouroux. On the cover we have reproduced a photograph, taken by one of us, of a specimen of the common South Australian Feather Coralline (*Stereotheca elongata*), taken at Marino. An enlarged diagram of the hydranths is depicted elsewhere in this article. In the photograph the larger zooids

are the gonothecae. This and certain other species of Hydroid zoophytes live among the brown seaweeds just below the lowest of low tides, and may be sought alive in rock pools which are never emptied of water, on reefs such as at Port Noarlunga and Marino. In such a quest the collector should lie flat beside the pool, bringing the eye close to the water, and look down the side to catch the outline of any specimens attached to it. They may be obscured by tufts of algae, so a hasty glance may not be sufficient. Also watch for the shadows for thus will one often secure the reality. The forms we seek are frail and less easy to see than the images sketched by the light on the rock beneath.

The hydrotheca of *Stereotheca* is a somewhat tubular cup, and affords an efficient protection for the hydranths when they are retracted. The gonotheca is greatly elongated and enlarged, and the distal end is somewhat produced. The medusae are degenerate or rather rudimentary, they are undetached in maturity and do not swim off as the medusae of *Obelia*. Nevertheless they are the bearers of the sexual cells, and scatter the ova which develop into the hydroid colony, in the manner already described.

In some forms of the *Hydrozoa* there are no free medusae, the zoophyte colony producing fixed reproductive zooids. In others again, there is no zoophyte stage, the organism existing only in the medusa (jelly-fish) form. In *Stereotheca* we saw a degenerate medusa stage; there are also forms with a degenerate zoophyte stage.

Thus we have zoophyte colonies known to produce free medusae, zoophyte colonies known not to produce free medusae, and medusae known to have no zoophyte stage. It is also noted that in some cases closely allied zoophytes produce very diverse medusae, while similar medusae in other cases may spring from very different zoophytes.

Which came first on the scene, the zoophyte or the medusa—the hydranth or the jelly-fish?

The life histories of the *Hydrozoa* may be represented by formulae.

Let H=a conspicuous hydranth stage.

M=a conspicuous medusa stage.

h=a degenerate hydranth stage.

m=a degenerate medusa stage.

O=the fertilized ovum.

1. O-H-O—example *Hydra*, found only in freshwater ponds.
2. O-H-m-O—example *Stereotheca*.
3. O-H-M-O—example *Obelia*.
4. O-h-M-O—example *Liriope*. A metamorphosis directly converts a *Hydra*-like form into a medusa.
5. O-M-O—example *Geryonia*; exists only in the medusa stage, through adaptation to a wandering life on the ocean wave far from land.

The accompanying text figure was prepared by Maurice Blackburn, M.Sc., of the Fisheries Section, C.S.I.R., Cronulla, New South Wales, and is here reproduced by permission. Common South Australian Hydroids are there depicted, greatly magnified.

A SOUTHERN RECORD OF THE YELLOW-BELLIED BAT

By E. F. BOEHM,

Sutherland, S.A., 4/6/1941.

The yellow-bellied bat (*Saccolaimus flaviventris*, Peters, 1866) appears to be uncommon in South Australia. Prof. F. Wood Jones ("Mammals of South Australia," p. 403, 1925) recorded specimens from Gladstone, Penfield and the Far North. It apparently inhabits the north-eastern portion of the Australian continent and southern records are rare.

An example of the species was captured in scrub between Tintinara and Coombe, S.A., in 1932. It was being chased by magpies

(*Gymnorhina*) and miners (*Myzantha*). Particulars of this specimen are as follows:—No. 95, Boehm collection; male, forearm 74 mm.; 11th May, 1932. Collector, Mr. W. J. Harvey.

The locality is approximately 36 degrees south latitude, and the occurrence seems to constitute the furthest south record for the State. As in New South Wales, this fine, large bat probably lives in colonies of four or five in hollow trees.

THE HABITAT OF SOME NORTHERN FLINDERS SNAILS

By

H. M. COOPER.

An interesting feature of many types of our native landshells is their characteristic habit of living in comparatively restricted areas. Thus two distinct species may often be observed living within close proximity to one another, yet with the line of demarcation sharply defined. It seems therefore, most desirable that localities from where specimens are taken should be carefully noted, more especially when the topography of the country changes abruptly. Loosely designated

described from "South Australia," and later Iredale gave the locality as "South Australia—Blinman eastwards." The type locality of this species is here given as 4 miles south of Blinman (See Cotton, S.A. Naturalist, Vol. 20, No. 1, Page 5). *Meracomelon meridionale* Gude, to give it its correct generic name, is keeled in the juvenile whorls while the body whorl becomes rounded towards the aperture. *Meracomelon suspectum* Iredale, was described as from Parachilna, but as already



place names have already caused much confusion. As an instance, *Meracomelon meridionale suspectum* Iredale, was described as from Parachilna, which is evidently incorrect. Parachilna is in typical sandy and loamy plains country, inhabited by *Sinumelon remissum*, a large globose snail found in areas with these features. *Meridionale suspectum*, a flat rock living type, however, exists in the Flinders Ranges, whose bold western scarp (at places 3,000 feet above sea level) commences about five miles to the east of Parachilna. As *meridionale* and *suspectum* figure prominently in this paper, they may now be described, as the two have already been confused and are distinct species. *Thersites (Badistes) meridionale* Gude, was

mentioned, the species does not occur there. This snail is found at Parachilna Creek cliffs, 6 miles S.W. of Blinman, which we designate the type locality. (See Cotton, S.A. Naturalist, Vol. 20, No. 1, Page 5.) *Meracomelon suspectum* is a flat shell, which has the keel permanently retained to the aperture. Unfortunately, the original figure given of the holotype is incorrect, as it shows a rounded body whorl and no keel at the aperture; it is, in fact, a typical *Meracomelon meridionale*. The two species occur together in the mountains, and are entirely different. In other parts of the district they occur alone. Their range has not yet been clearly defined, but material from 38 localities indicates that they are plentiful at least over the full width of

the ranges, that is, about 25 miles east and west along a belt, with Blinman approximately as its centre. Elevation and rainfall both rise sharply as the hills are entered from the plains from either side, with, in the main, a corresponding increase in the relative occurrence of the snails under review. Both species, therefore, seem to flourish best under comparatively moist conditions and are confined to rocky localities, such as the ledges shown in the accompanying photographs and also in the broken and precipitous rock faces of gum creeks and generally, where disturbed rock surfaces afford cover. About 20 living specimens of *Meracomelon suspectum*, taken near Blinman, were kept under observation at Glenelg for a period of over six months; there were also several *Notobadistes aversum*, a small globose snail from the same locality. *Meracomelon suspectum* invariably sheltered under the rocks provided for the purpose, while *Notobadistes aversum* were always observed partly buried in the surface soil. *Meracomelon meridionale* and *suspectum* do not occur in open or hilly country in the area mentioned above, unless suitable rock shelter is available. Mount Emily, a rather striking hill about 1,700 feet above sea level and 8 miles south of Blinman, is shown in the left-hand photograph. The horizontal rocky ridge near the summit is a feature of the landscape in this locality, the many crevices providing ideal shelter. The other photograph shows a typical group of *Meracomelon meridionale* on the same mountain. A significant occurrence of snail distribution in these hills is the abundance of dead juveniles wedged amongst the crevices, suggesting that they, along with other forms of life, had been overtaken before maturity by prolonged periods of drought, unfortunately all too fre-

quent in the arid parts of South Australia. *Contramelon howardi* Angas, of which we have many specimens, has frequently been confused with *Meracomelon suspectum*, but it is generically distinct, being smaller, more solid and has a round aperture with a strongly reflexed lip. It may be helpful to remark at this point that it is possible to collect, on occasions, isolated dead snails of mountain types in areas on the plains flooded after heavy rains in the ranges and carried thence by gum creeks. In such cases, the collector would observe due caution in deciding the distribution of his specimens. In recommending the desirability of recording all possible data covering our native snails before they are swept away by cultivation, burning off, and the other necessary inroads of civilised life, mention may be made of *Cupedora evandaleana* Pfeiffer, once typical of the Adelaide Plains and now probably extinct or nearly so, although it may still occur in the Mount Lofty Ranges. We now have here at least one imported carnivorous slug, *Testacella haliotideia* Draparnaud, and four imported snails, *Helicella ericetorum* Muller, *Euparypha pisana* Muller, *Cochlicella acuta* Muller, and *Helix aspersa* Muller, the latter causing serious damage to vegetation. Transported by numerous agencies of modern life, all five are steadily spreading. As an example, *Helix aspersa* Muller was established at Muston, Kangaroo Island, by the medium of vegetables landed at the jetty, spreading thence to Salt Lake by railway on bags of coal. It is certainly tragic that whilst imported snails thrive here both in quantity and size, our harmless native representatives, by the very nature of ever changing conditions, speedily lose ground and face ultimate extinction.

NOTICE TO MEMBERS.

In the next issue of this magazine it is proposed to publish a list of the names and addresses of all members of the Section.

Members are requested, therefore, to notify

any change of address as early as possible.

W. M. NIELSEN,

Hon. Secretary.

EDIBLE SHELL FISH IN THE FIJI ISLANDS

By

W. R. STEADMAN

Perhaps nowhere in the world is the extensive use of shell fish for food by the natives a more important part of the ordinary diet of the people than in the Fiji Islands. Almost every day the Fijian women go out at low tide with palm leaf baskets gathering all kinds of shell fish for their daily food. With an iron spiked spear to probe around holes in the reef, they search for fish, octopus, and other edible denizens of the coral reef. Their sight is keen, and their prowess in capturing their prey is excellent from acquired ability daily improved. At other times the women may be seen slowly exploring mud flats and shallow estuaries in search of the many species of edible mollusca found there. In the rivers, particularly the Rewa and Ba Rivers on the Island of Viti Levu, women wade out into the deep water and dive for the fresh water mussels found in immense quantities there. Sometimes one or two men may be seen searching with the women, and frequently young children join them, but the native women are the main daily searchers for reef fish and mollusca.

On Saturday mornings it is a most interesting sight to visit the native open air markets at Suva, Nausori, Ba, Lautoka, and other centres. Here, in addition to fruit and vegetables from native gardens, can be seen great quantities of shell fish contained in palm leaf baskets set out for sale. Business for the whole morning, and often well on into late afternoon, is brisk, and sometimes it seems incredible that so great a quantity of shell fish is regularly available and sufficient purchasers forthcoming to use it all. Although the Fijians are fond of beef, and there is a good supply of local meat at reasonable prices, nevertheless a very great quantity of fish and shell-fish is eaten, and forms a very valuable part of the people's regular diet. In the recent Report of a Committee of the British Colonial Office on Nutrition in the Colonial Empire, on page 106 of Vol. II it is stated

"The majority of Fijians obtain an adequate supply of protein food from fish and shell fish obtained from lagoons and rivers." And in Vol. I page 67 it is stated "Fish can contribute a number of constituents which are of importance to the dietary. In particular its proteins may be very valuable indeed. Fish oil, fish livers, and fat fish such as herring and salmon are also rich in vitamin A, and small fish entirely consumed give calcium and other inorganic elements. In addition, sea fish are an important source of iodine. In short, they are a most valuable foodstuff, and we regard it as most important that supplies of fish in and around Colonial waters should be developed to the maximum possible extent."

As a rule both fish and shell fish are eaten with some vegetable food, either yams (uvi), taro (ndalo), tapioca (kassava), sweet potatoes (kumala), or with cooked leaves such as taro leaves, or leaves of the chili bush.

When boiled, and sometimes when eaten raw, the animal is extracted from the shell by means of a lemon tree thorn, otherwise the shell is shattered.

The most common shell fish eaten are fresh water mussels—*Cyrena batissa unioniformis* (kai), which are obtained in the river beds of the main rivers in immense quantities, and are very popular with the natives. There are two species, which are distinguished by the natives by the names kai mbuli and kai tamba ni sama. These are all eaten boiled.

Another exceedingly common shell fish, which is usually eaten raw, is the Pearl Oyster—*Pinctada martensi* (thivathiva), which occurs in certain coastal localities in great abundance, particularly around the islet of Viwa adjacent to the old capital, Mbau. Other species of Pearl Oyster—*Pinctada margaritifera*; *Malleus malleus*, *Pteria* sp.; and *Pedalion* sp., are also used, but in less numerous quantities. The *Spondylus*, also called

thivathiva by the natives, is a popular food. Oysters of several species—*Ostraea* spp. (ndio), are also eaten raw. Among the bivalves *Anadara antiquata scapha* (kaikoso) together with several species of cockles (vivili) are extensively used, and are eaten both cooked and raw. Limpets—*Nerita* spp., *Natica* spp., and *Polinices mamilla* and *P. melanostoma* (Ndrevulakata) are also eaten both cooked and raw.

A further very common article of diet is the Spider Shell—*Pteroceras lambis* (yanga), of which there appears to be an abundant supply on the shallow muddy reef near the mouths of several rivers. These are boiled, and sometimes form a meal in themselves, though perhaps more often eaten with vegetables. There are several other kinds of *Strombus* that are eaten, especially *Str. gibberulus*, *Str. urceus*, *Str. luhuanus*, and when available *Str. bryonia*, *Str. lentiginosus*, *Str. latissimus*, *Str. laciniatus*, *Str. aurisdianae*. The larger *Strombus* are called yanga by the Fijians, and the smaller species ngera. Prices for shell fish are very low, and a basket of about 24 *Pteroceras lambis* is sold for sixpence in Suva native market.

The *Tridacna* (vasua) is a very popular meal with the Fijian people. It is eaten in three ways:—(1) Sometimes eaten raw. The women cut open the hinge and extract the flesh, which they cut up into pieces and mix with lemon juice and chilis (roketi). In this form it is eaten with boiled yams or taro, and deemed a great delicacy. (2) Sometimes it is eaten cooked. The flesh is extracted from the shell and boiled with taro leaves, water cress, or chili leaves, or it may be boiled in cocoanut milk. This cocoanut milk is made by scraping the white of the cocoanut into a mince which is mixed with water and then on being squeezed out the moisture looks like milk with the juice of the cocoanut taken off by the water. Although this method of boiling is often used, the natives prefer the first method eaten raw. (3) Sometimes the flesh of the *Tridacna* is smoked, and in this way it may be kept for two months, or even longer, but when it is soaked and boiled for use later on, it is rather tough, and not so popular.

Various species of *Conus* are eaten boiled.

The natives call all Cones vuru. *Trochus niloticus* (sithi), and other types of *Trochus*, are eaten. The Fijians save the shell of *Trochus niloticus* for sale to merchants, and get a good price for first grade shell. A number of different species of *Turbo* shells (la) are also eaten, especially *Turbo argyrostoma*. I am told that the natives do not eat *Turbo petholata*, although at times it is found in quantities. The natives call the operculum of *Turbo petholata* matakara-rawa, which means "green eye."

Of the larger shells *Triton tritonis*, *Ranella lampas*, *Cassia* spp., and *Murex ramosus*, are all eaten cooked, and served with vegetables.

The natives call all these larger shells ndavui.

Very many smaller shells such as *Terebra* spp., *Mitra* spp., *Oliva* spp., *Gerithium* spp., *Cymatium* spp., *Vasum* spp., *Dolium* spp., are all eaten cooked with vegetables, but are not so widely used as other kinds.

The natives call all these by the general term vivili. *Patella* (yamiyami) and *Haliotis ovina* are also eaten raw. *Piana serrata* is abundant in the mud flats near the shore, and is sometimes gathered and eaten boiled. The native name for the Pinna is thiware. Chitons (tunduruku) are popular, and are sometimes eaten raw, but often boiled with taro leaves and eaten in that way. *Echinus* spp. (nggina for short spined, and ngasangasau for long spined), especially *Diadema setosum*, are eaten both raw and cooked. Sea cucumbers—*Holothuroidea* (ndri), are also used for food. They are cooked and then skinned for eating. As far as I can gather, for some reason not known, no Cowries are ever used for food. The general name for Cowries used by the natives is mbuli.

Of crustaceans there is an abundant supply, and these are very popular. They include *Scylla serrata* (nggari)—a large mud crab; *Calappa fornicata* (nggari vatu)—rock crabs; saltwater crayfish—*Panulirus penicillatus* (urau); fresh water prawns—*Palaemon* sp. (ura); mangrove lobster—*Thallasina anomala* (mana). These together with several other kinds are boiled and eaten.

A NEW SOUTH AUSTRALIAN PIPE FISH

By

HERBERT M. HALE,

Director, South Australian Museum.

FAMILY SYNGNATHIDAE.

Histiogamphelus gallinaceus sp. nov.

Male.—Dorsal fin with 23 rays; pectoral with 12 rays; caudal with 10 rays. Thoracic annuli 20; caudal annuli 31. Subdorsal annuli 5 + 2. Brood pouch 13 caudal annuli.

Head about four and one-half times into length of trunk and twelve times into total length; eye a little less than half as long as snout, which is two-fifths as long as head. Trunk two-thirds as long as tail. Caudal fin about one-third as long as head. Cephalic crest rising steeply from the lips, evenly rounded and not bisinuate; continued backwards to beyond middle of second, or pectoral, annulus as a low ridge; no other trace of dorsal median ridge. Latero-superior ridges ending on middle of length of second caudal annulus. Medio-lateral ridges just reaching on to first caudal ring. Latero-inferior ridges and a median abdominal ridge prominent. Tail square in section with four ridges, the upper of which commences near anterior margin of last thoracic annulus

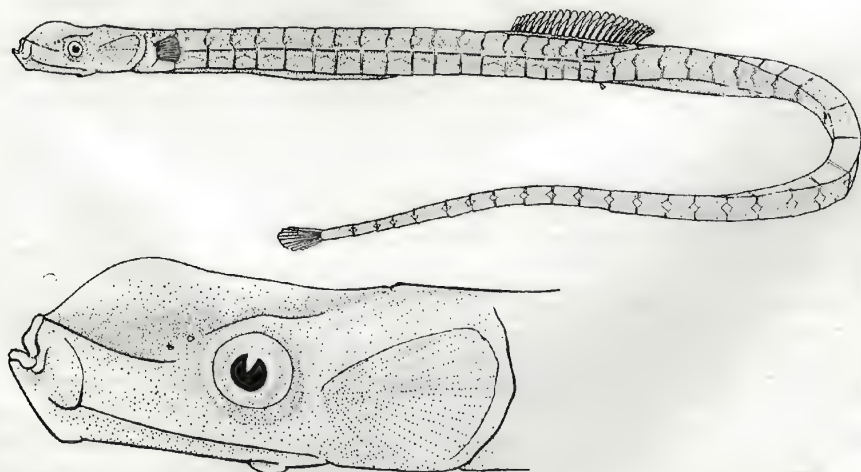
above termination of medio-lateral ridges. Caudal and minute anal fin fan-shaped.

Colour: Dark brown with front of snout white and with grey mottlings on sides and belly. Dorsal fin pink; caudal black.

Length: 196 mm.

Loc.—South Australia, Gulf St. Vincent, silt grounds at Outer Harbour. (A. E. McWaters, August, 1941.) Holotype, male, in South Australian Museum. Reg. No. F.2057.

H. gallinaceus differs from *H. maculatus* (described from a single female) in that the cephalic crest is elevated anteriorly and is not bisinuate, the ridge defining the upper margin of the snout below the crest extends towards the middle of the depth of the eye rather than towards its lower margin, while posteriorly the supra-orbital ridges trend upwards towards the profile. Further, the colour is entirely different, and there is no trace of a median dorsal ridge, excepting for the continuation of the cephalic crest to the second thoracic annulus.



Histiogamphelus gallinaceus sp. nov. Male, holotype.

THE EUCALYPTS OF THE NATIONAL PARK

By

N. B. LEWIS.

The identification key given below is not a botanical classification. It is a rough field classification, and as such is applicable only to those parts of National Park and its immediate environs which are still natural forest. It should also be understood that occasional trees, by reason of various natural factors, may not conform strictly to the classification.

Detailed descriptions of the species listed, and explanations of the botanical terms used, will be found in J. M. Black's "Flora of South Australia." For more detailed locations of the various species in National Park, reference should be made to the F.N.S. publication, "National Park of S.A."

THE EUCALYPTS OF THE NATIONAL PARK.

A. ROUGH BARKS:

Bark rough throughout, including branches. Brown or darker in colour, except *E. fasciculosa*, the bark of which, even if rough on the upper branches, is whitish in colour.

B. SMOOTH BARKS:

Bark smooth, whitish or greyish, often throughout, and almost always on the upper branches. Bark often rough and darkish about the base of the trunk, but not on branches. Bark of *E. fasciculosa* may be rough throughout, but is whitish in colour.

A. Rough Barks:

- B. Fruits small, up to $\frac{1}{4}$ in. long, rarely as broad *E. odorata*.
- 2. Fruits large, $\frac{3}{8}$ in. to $\frac{1}{2}$ in. long, about equally broad.
 - C. Fruits not pedicellate *E. Baxteri*.
 - C. Fruits pedicellate *E. obliqua*.

A. Smooth Barks:

- B. Fruits large, over $\frac{3}{8}$ in. long and broad.
 - C. Fruits not pedicellate, or very shortly so *E. cosmophylla*.
 - C. Fruits pedicels very long *E. leucoxylon*.
- B. Fruits small, seldom exceeding $\frac{1}{4}$ in. in length.
 - C. Valves sunken *E. fasciculosa*.
 - Valves exerted.
 - D. Buds mostly cruciform (three in the form of a cross).
 - E. Juvenile leaves bright green, lanceolate *E. viminalis*.
 - E. Juvenile leaves grey-green, cordate *E. rubida*.
 - D. Buds never cruciform, 5 to 12 in a cluster, bud caps rostrate *E. rostrata*.

Confirmatory characteristics to the above classifications are:

E. odorata (Peppermint): Spindly tree, trunk and limbs blackish in appearance. Fruits heavily clustered (in umbels), umbels set back from the leafy ends of the branches (i.e. are lateral). Pedicellate, valves sunken.

E. Baxteri (Baxter's stringybark):

Fruits top-shaped to hemispherical, not pedicellate, umbels many-flowered (and thus many-fruited), lateral. Rim very broad, exerted. Valves exerted, generally 4.

A few in north-eastern corner of the Park. Some good specimens in Sunset Rock area.

E. obliqua (Stringybark):

Fruits cup-shaped, pedicellate, clustered in large, lateral umbels. Rim sloping sharply inward. Valves sunken.

Higher parts of the Park, northern slopes of Long Gully, and the north-eastern corner along and beyond the railway line.

E. cosmophylla (Scrub Gum):

Small tree, up to about 20 feet. Fruits mostly in threes, not pedicellate, or only very shortly so. Over $\frac{1}{2}$ in. long and broad. Valves slightly exsert.

A few trees along the southern boundary.

E. leucoxylen (S.A. Blue Gum):

Fruits often single or in twos, lateral, $\frac{3}{8}$ in. to $\frac{1}{2}$ in. long and broad. Rim often deciduous as a brown, circular ring soon after fall of the flowers. Valves deeply enclosed. Long pedicels, mostly $\frac{1}{2}$ in. to $\frac{3}{4}$ in. long.

All through the Park.

E. fasciculosa (Pink Gum):

Fruits cup-shaped, $\frac{1}{4}$ in. long, seldom less, pedicellate. Large terminal umbels, but never closely clustered.

Mostly in the north-eastern corner, on highest parts of the Park. Upper parts of the Queen Victoria Drive.

E. viminalis (Manna Gum, Ribbony Gum):

Bark sometimes persistent on to the lowest branches, but, if so, long and ribbony, deciduous.

Fruits top-shaped to hemispherical, $\frac{1}{4}$ in. long and broad, many in threes, cruciform, the central one shortly pedicellate, the two lateral ones sessile. This arrangement is prominent in the young buds. Leaves long, rather darker green than usual, with prominent veins. Juvenile leaves lanceolate, bright green.

Long Gully Oval and its southern slopes; Queen Victoria Drive.

E. rubida (Candlebark):

As *E. viminalis*, but distinguished by

- (1) Bark typically very white above.
- (2) Fruits much smaller.
- (3) Juvenile leaves cordate, grey-green.

N.B.—Distinction between these trees is often difficult and controversial. The juvenile leaves are the only certain means of identification.

Some doubtful specimens just above Picnic Point, Queen Victoria Drive.

E. rostrata (River Red Gum):

Fruits very small, generally only about $\frac{1}{8}$ in. long. Valves very upright and erect, a further $\frac{1}{8}$ in. long. Bud caps always pointed, and almost always bent over or twisted at the tip (i.e. rostrate). Umbels many-fruited, but not crowded and lateral.

All through the lower parts of the Park.

Mention might also be made of the planted Sugar Gums (*E. cladocalyx*) bordering the main drive at the rear of the railway station. Sugar Gums have a characteristic smooth, yellowish, often patchy, bark, and can be readily identified by the conspicuous brownish colour of their crowns, due to the young tips.

AN ADDITION TO THE ORCHIDACEAE OF SOUTH AUSTRALIA

By

HAROLD GOLDSACK.

In the early part of September, 1940, Mrs. Moss. Morgan collected at Coffin's Bay, S.A., a parcel of orchids which she sent to Mr. J. D. Somerville, a member of our section who had spent some considerable time in the Port Lincoln district.

Among the orchids in the parcel were several plants of a species of *Pterostylis* (Greenhood's), which attracted Mr. Somerville's notice by their colouring, white with red striae, and by the fact that the red labellum was protruded through the sinus of the lower lip of the flower.

It was apparent, when the plants reached me, that they did not conform to the description of any of our known South Australian species. Close examination of the details of the flower, however, showed that they did tally with *Pterostylis Hamiltonii*, Nicholls, a species described from Boyup Brook, W.A., in 1933 (Vic. Nat., Vol. L., August, 1933, p. 89).

A specimen of this *Pterostylis*, together with dissections of a flower, was sent to Mr. W. H. Nicholls, of Victoria, who confirmed the identification.

A condensed description of the species taken from Mr. W. H. Nicholls' paper is given. *Pterostylis Hamiltonii*, Nicholls. Slender, glabrous plant, 6-15 cm. high. Stem leaves 1-6 lanceolate, leaves reduced to 1 or 2 bracts at base, increasing upwards to 3 cm. Flower, large, solitary. White, with longitudinal red striae. Galea 2.5-3 cm. long. Apex shortly acuminate. Lower lip erect with broad sinus, the long filiform points embracing and exceeding the galea. Labellum

on short claw, almost wholly red, straplike, apex curved forward slightly and reaching well beyond sinus of lower lip when relaxed. Lamina 1.5-2 cm. long, oblong linear with long obtuse point. Basal appendage much curved, apex beset with short barbellate setae. Column erect, 1.3-1.5 cm. almost wholly reddish brown, upper lobe with short erect subulate tooth, lower lobe oblong, obtuse, margins with short inturned cilia. Radical leaves not present at flowering stage.

Distribution, W.A., Boyup Brook, June, July, S.A., Coffin's Bay (Mrs. M. Morgan), August-September; Corny Point (Rev. H. A. Gunter). Mr. Somerville tells me that he collected similar plants at Port Lincoln on August 6, 1922. These were sent to Dr. R. S. Rogers, and were presumably classified as *Pt. reflexa* R. Br., this being the name noted in Mr. Somerville's diary for the orchids found on that date. The interesting point has been raised by Mr. Somerville: "Have all records of *Pt. reflexa* R. Br. and *Pt. robusta*, Rogers, found on the West Coast, referred to the species *Pt. Hamiltonii*, Nicholls?" Perhaps if those of our readers who have collected *Pt. robusta*, Rogers, on the West Coast would examine their specimens in the light of this article we might be able to decide whether one species or two have actually been collected. The colour of the flower, and especially the protruding strap shaped labellum, distinguish *Pt. Hamiltonii*, Nicholls, from our well-known *Pt. robusta*, Rogers.

Since writing these notes I have seen further specimens of this orchid collected at Corny Point in September, 1935, by Rev. H. A. Gunter, and which are now in his herbarium.

The Chairman (Mr. B. C. Cotton)

Wishes All Members

The Compliments of the Season for
Christmas, 1941

FIELD NATURALISTS VISIT THE WAITE INSTITUTE

On the afternoon of Saturday, June 7, a party of the Field Naturalists visited the Waite Institute, where they were met by the Director, Professor J. A. Prescott, and shown a selection of out of door projects of great interest to the naturalist.

A group of three wheat stacks built at the Institute by the Australian Wheat Board for the Department of Entomology aroused great interest. The stacks which contain between them 1,400 bags of wheat are built according to the standard practice of the Board.

Members were interested in the methods used to protect the stacks from ground moisture and from the weather and with the arrangements made to protect them from mice. One of the stacks contains only F.A.Q. wheat, the second contains a proportion of wheat with more moisture than is usual or desirable, and the third contains a proportion of bags of wheat which is already infested with weevil. In this way Professor Davidson and his entomologists can observe how the weevil spreads, and how its spread is affected by weather conditions. One of the chemists, Mr. A. E. Scott, is assisting in this work by following up the change in moisture content of the grain, and the composition of the air in the stack, and by observing the temperature in the stacks.

Tubes for sampling and thermo-couples for determining the temperature are built into the stacks for the purpose of making these observations. The stacks will be kept under observation for two years and possibly longer.

Another interesting feature demonstrated was the method used in trying to reclaim for pasture a paddock that had been denuded of its herbage by traffic and overgrazing, and

which had possibly been subject to sheet erosion when under the plough, probably more than half a century ago. Even when the paddock was not grazed, there was little response to rain owing to the absence of seed, or owing to the hard surface over which the water ran away as soon as it fell. The first step was to plough single furrows exactly along the contour, at intervals of half a chain. When rain falls and is not absorbed, it is caught in the furrow and can then soak into the ground. Along the furrows kikuyu grass has been planted, and where erosion is severe a cover of straw or turves of kikuyu and phalaris has been placed.

The principle is to keep the rain that falls on the country in the country. Everyone knows that we never get quite enough rain in South Australia, and so why waste it?

Another experiment close by illustrated the effect of different kinds of phosphate fertiliser on nature pasture. On the unmanured ground native grasses like spear grass (*Stipa*) and wallaby grass (*Danthonia*) have still been maintained, but on the pasture top-dressed with super the native grasses have suffered from competition with the introduced annual plants. A first class pasture must contain perennial elements, and this is obtained at the Waite Institute by the use of phalaris to replace the native kangaroo grass (*Themeda*) which cannot stand stocking, and which disappeared many years ago from the Adelaide plains, and the native wallaby grass which cannot compete with the annual clovers and weeds.

The visitors were also shown the sheep pens where the nutrition experiments are carried out by the Council for Scientific and Industrial Research, and the new wool shed.

Report of Excursion to River Onkaparinga Gorge, Noarlunga, on 1/4/39

A party of 12 went by train to Noarlunga, where they were met by a party of scholars, who were supplied by the head teacher, and who showed the members up the Gorge. The walk upstream proved much less arduous than was expected, although the party only journeyed about one mile from the township. A map kindly supplied by Mr. W. Tough was found to be very helpful. Over 56 years ago Prof. R. Tate collected in this gorge and his specimens are preserved in the Adelaide University Tate Herbarium. *

During the afternoon 70 species of plants were collected or noted; 20 of these were of alien origin.

The most interesting collections were the following:—A rigid spinescent shrub in the violet family (*Hymenanthera angustifolia*), which is very rare and is only known from three localities; *Eremophila longifolia* was growing on the river-cliffs and was in flower, and it is possibly the first record of this species in the southern districts. The plant is usually found in the northern and dry areas where practically all the 37 species grow; the generic name is from Greek, meaning desert-loving and refers to the dry habitat. A rare cypress pine (*Callitris tasmanica*) was found on the bank of the river and only one tree was seen. This species is only known from several localities, with very few individual plants. A member of the heath family (*Acrotriche cordata* probably), which is a coastal plant, although it occurs in a few inland places. Three wattles were found; one is probably the somewhat rare and localised varnish wattle (*Acacia verniciflua*), but it was neither in flower nor fruit; the other one was *A. rupicola*, which is not at all plentiful in our State. The purple flowering teatree (*Melaleuca decussata*) found in the bed of the river is usually found higher in the range.

The leader, Mr. E. H. Ising, presented the boys who acted as guides each with a copy of "The South Australian Naturalist."

A trip to the same locality in the spring should reveal more botanical treasures, as the gorge seems to be the last resort of some of the original and rare species of this district. List of plants collected or observed, River Onkaparinga Gorge, Noarlunga, 1/4/39:—

Callitris tasmanica.
Triglochin striata.
T. procera.
Phragmites communis.
Cyperus vaginatus.
Typha angustifolia.
**Asphodelus fistulosus*.
Calostemma purpureum.
Casuarina stricta.
Loranthus Exocarpi.
Muehlenbeckia adpressa.
Rhagodia.
Atriplex Muelleri.
A. semibaccatum.
Chenopodium pumilio.
Chenopodium sp.
Enchylaena tomentosa.
Salsola Kali.
**Amaranthus viridis*.
Alternanthera.
Boerhaavia diffusa.
Carpobrotus aequilaterus.
Stellaria.
**Diplotaxis*.
Pittosporum phylliraeoides.
Bursaria spinosa.
Rubus parviflorus.
Acacia retinodes.
A. verniciflua. (?)
A. rupicola.
Psoralea patens.
**Oxalis cernua*.
O. corniculata.
Zygophyllum.
Adriana Klotzchii.
**Euphorbia peplus*.
Dodonaea.
Lavatera plebeja. (?)
Sida corrugata. (?)
Hymenanthera angustifolia.
Callistemon salignus.
Leptospermum scoparium.
L. pubescens.
Eucalyptus rostrata (camaldulensis).
Melaleuca decussata.
**Hypericum perforatum*.
**Foeniculum vulgare*.
Acrotriche cordata. (?)
**Olea Europaea*.
**Anagallis*.
**Asclepias rotundifolia*.
**A. fruticosa*.

Dichondra repens.
Convolvulus erubescens.
*Heliotropium europaeum.
*Salvia Verbenaca.
*Marrubium vulgare.
*Datura.
Solanum nigrum.
*S. Sodomaceum.
*Lycium ferocissimum.
*Nicotiana glauca.

Eremophila longifolia.
Lobelia anceps.
Wahlenbergia vinciflora.
Olearia ramulosa. (?)
*Xanthium spinosa.
Centipeda.
*Centaurea calcitrapa.
Juncus pauciflorus.
Corbiculina angasi.
Hydrobia victoriae.

FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH
AUSTRALIA—FIFTY-SEVENTH ANNUAL REPORT

Ladies and Gentlemen,

Your Committee has pleasure in submitting the fifty-seventh annual report.

With one exception all meetings of the Section have been held in the Royal Society rooms, and the various subjects chosen by our lecturers proved most instructive, and were well received.

The conversazione which took place in February was held in the Lady Colton Hall, Hindmarsh Square.

Throughout the year a good average attendance has been maintained, both at the evening meetings and at the field excursions, and the objects of the Section have been kept to the fore.

Membership now stands at 164, and is comprised of three Life Members, eight Honorary Members, one Corresponding Member, and 146 Ordinary Members.

We record with sorrow the death of three esteemed and valued members of the Section: Messrs. Edwin Ashby, John Royle, and Miss I. Vohr.

During the period under review The S.A. Naturalist has been published three times, and previous standards were maintained.

The committee met on ten occasions during the year, and many important matters concerning the welfare of the Section discussed, and new ideas put into operation.

At the beginning of the year the work of the Herbarium was undertaken by a small committee, but we are pleased to note the formation of a Botany Club as a branch of the Section, and the work is now being carried on under their direction.

We are indebted to the Malacological Branch for their valued assistance throughout the year in providing leaders for beach excursions, and for the very interesting evening meeting in July last.

(Signed) W. M. NIELSEN,

Hon. Secretary.

STATEMENT OF RECEIPTS AND PAYMENTS TO JULY 31, 1941.

EXPENDITURE.			INCOME.		
	£	s. d.		£	s. d.
To Printing—			By Balance in Bank, 31/7/40	49	18 1
"The Naturalist"	66	8 11	Subscriptions and Donations	50	7 9
Blocks, Programmes, etc.	13	12 8	Colored Plates	1	0 0
Postage	4	19 0	Sales—		
Rent, Epidiascope to June 30	0	10 6	"The Naturalist"	0	9 0
Rent of Room	4	9 0	Other Publications	0	7 6
Presentation to Hon. Secretary	5	0 0	Badges	1	2 6
Conversazione	5	17 0	Excursions	31	8 11
Film Hire	0	14 0	Conversazione	3	18 9
Excursions	28	18 0	Savings Bank Interest, General		
Badges	3	0 0	Account, 31/7/41	1	3 9
Sundries	0	13 7			
Balance in Bank, 31/7/41	5	13 7			
	£139	16 3		£139	16 3

We have examined the books and vouchers setting forth the transactions of the Field Naturalists' Section of the Royal Society of S.A., Incorp., for the year ending July 31, 1941, and certify that the above account of Income and Expenditure is correct.

August 29, 1941. (Signed) WALTER D. REED, F.C.A. Aust.),) Hon. Auditors.
(Signed) B. B. BECK,)

LIFE MEMBERSHIP ACCOUNT.

	£	s. d.		£	s. d.
Life Membership Account: Balance			Balance in Savings Bank as at		
as at 31/7/40	16	9 0	July 31, 1941	16	17 0
Interest, 31/7/41	0	8 0			
	£16	17 0		£16	17 0

Examined and found correct.

August 29, 1941. (Signed) WALTER D. REED, F.C.A. (Aust.),) Honorary Auditors.
(Signed) B. B. BECK,)

ROYAL SOCIETY OF S.A., INCORP., FIELD NATURALISTS' SECTION.

ASSETS.			LIABILITIES.		
	£	s. d.		£	s. d.
Balance in Bank	5	13 7	Subscriptions prepaid for 1941-42	1	13 9
Life Membership Account	16	17 0		92	18 4
Cupboards	4	5 0			
Library	40	0 0			
S.A. Naturalist	4	10 0			
Films, Toolach Wallaby	15	0 0			
17 Badges	2	2 6			
Outstanding Account	1	4 0			
Outstanding Subscriptions	5	0 0			
	£94	12 1		£94	12 1

H. GREAVES, Chairman.
M. EMERSON, Hon. Treasurer.

COLORED PLATE FUND.

	£	s. d.		£	s. d.
Balance as at July 31, 1940	5	8 0	Balance as at July 31, 1941	6	8 0
Donation	1	0 0			
	£6	8 0		£6	8 0

August 29, 1941. (Signed) WALTER D. REED, F.C.A. (Aust.),) Honorary Auditors.
(Signed) B. B. BECK,)

The Field Naturalists' Section

EXCURSIONS

Date.	Locality.	Time.	Subject.	Leader.
1942.				
Jan. 17—	Semaphore South	Train, 12.55 p.m.	Marine Life	Rev. W. R. Steadman
Feb. 2—	Port Adelaide—Glenelg	Train, 9.5 a.m.	Boat Trip	Mr. B. C. Cotton
	14—Flinders Street, Kent Town	Tram, 1.30 p.m.	Aquaria	Mr. P. Geisler
	28—Marino	Train, 1.11 p.m.	Hydroids	Mr. F. K. Godfrey
Mar. 7—	Napier Terrace, Unley Park	Train, 1.23 p.m.	Aviaries	Mr. S. E. Terrill
	21—Mt. Lofty	Train, 1.23 p.m.	Flower Show	Mr. A. J. Morison
	28—River Torrens	Tram, 1.10 p.m.	Freshwater Shells	Mr. A. K. Beasley
April 3—6—	Port Elliot	Train and Motor	Marine Life	Mr. F. K. Godfrey
	18—Grange	Train, 1.15 p.m.	Shells	Mr. W. G. Tucker
	27—Taillem Bend	Motor, 9.0 a.m.	Swamp Life	Mr. B. C. Cotton
May 9—	Museum	Entrance, 2.0 p.m.	Ethnology	Mr. N. B. Tindale
	23—Outer Harbor	Train, 12.55 p.m.	Seaweeds	Miss D. M. Matthews
June 8—	Mannum	Motor, 9.0 a.m.	Physiography	Mr. A. G. Edquist
	20—Botanic Gardens	Entrance, 1.0 p.m.	Shrubs	Mr. H. Greaves
	27—Henley—Glenelg	Tram, 1.4 p.m.	Shells	Rev. H. Gunter
July 4—	Museum	Entrance, 2.0 p.m.	Ornithology	Mr. H. T. Condon
	11—Semaphore—Grange	Train, 12.55 p.m.	Beach Life	Mr. B. C. Cotton
	25—Field River	Motor, 1.0 p.m.	Geology	Mr. R. Sprigg
Aug. 1—	Kooyonga	Tram, 1.4 p.m.	Birds and Pond Life	Mr. W. G. Buick
	15—Eden	Train, 1.0 p.m.	Orchids	Mr. H. Goldsack
	29—Largs	Train, 12.55 p.m.	Shells	Mr. R. C. Shinkfield

TRAM EXCURSIONS.—Meet in Grenfell Street, by T. & G. Building.

TRAIN EXCURSIONS.—Will members obtain their tickets and meet on the train.

MOTOR EXCURSIONS.—Meet at the Town Hall, Adelaide. Book with the Secretary or the Treasurer.

EVENING MEETINGS

1942.		1942.	
Feb. 17—	"Brown Men and Red Sand," Mr. C. P. Mountford	May 19—	"Our Changing Landscape," Mr. F. C. Martin
Mar. 17—	"A Naturalist in Norway," Mr. A. G. Edquist	June 16—	Shell Club Evening: Lecturettes
April 21—	"Parks and Gardens" Mr. B. J. E. Bone	July 21—	Botany Club Evening: Lecturettes
		Aug. 18—	"The Clothing of Animals," Mr. J. E. L. Machell

Meet at the Royal Society Rooms, North Terrace.

MALACOLOGICAL SOCIETY: Evening Meetings

1942.		1942.	
Mar. 2—	"Sea-anemones" Mr. F. K. Godfrey	July 6—	"West Coast Chitons" Rev. B. J. Weeding
	16—"Turridae" Mr. B. C. Cotton		20—"Shells: Parasitic and Commensal," Mr. B. C. Cotton
April 6—	"New Guinea Shellfish" Rev. H. K. Bartlett	Aug. 3—	Annual Meeting and Exhibits by Members
	20—"Land Snails" Mr. W. M. Nielsen		17—"Correlation of Gastropoda," Mr. B. C. Cotton
May 4—	"Mitridae" Mr. B. C. Cotton		
	18—"Corals" Miss D. M. Matthews		
June 1—	"Foraminifera" Mr. W. J. Parr		
	15—"Triphoridae" Mr. F. K. Godfrey		

Meets at the South Australian Museum, North Terrace.

THE BOTANY CLUB: Evening Meetings

1942.		1942.	
Feb. 11—	"Sced Dispersal" Miss L. Harry	June 10—	"Mosses" Mr. H. Goldsack
	25—"Compositae" Miss C. M. Eardley		24—"Plant Conservation" Dr. H. C. Trumble
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QUINQUELOCULINA
POLYGONA.



SPIROLOCULINA
ANTILLARUM.



TRILOCULINA
OBLONGA.



TRILOCULINA
TRICARINATA.



NUBECULARIA
LUCIFUGA.



VERTEBRALINA
STRIATA



PENEROPLIS
PLANATUS.



CRIBROBULIMINA
POLYSTOMA

SOUTH AUSTRALIAN FORAMINIFERA.

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FORAMINIFERA

By W. J. PARR

For more than fifty years, South Australia had, in the person of the late Professor Howchin, one whose work on the Foraminifera, limited though it was in quantity, placed him in the front rank of workers on the group. His paper on the Foraminifera of the Port Adelaide River, published in 1890, constitutes almost all we know of the occurrence of these organisms in the vicinity of Adelaide. Professor Howchin's passing has left a gap which has not yet been filled, and I hope that these notes may inspire one or more of my readers to undertake the study of these most fascinating organisms. I may here sound a note of warning. An interest in the Foraminifera, once acquired, soon develops into a disease which persists and increases in intensity with the passage of time.

Some of you will perhaps be wondering just what are these Foraminifera. This question may best be answered by asking you to go with me in imagination to one of the sandy beaches near Adelaide, say that at Glenelg. If we walk along the beach at low tide, we will probably find that, in the vicinity of any projection, such as a small point, which checks the drift of the waves, the ripple marks are occupied by a whitish sediment, which apparently consists of minute shell fragments. When this material is examined with a pocket lens, it will be seen that the light coloured particles are largely minute, but perfect shells. If they are white and chalky-looking and of very irregular shapes, they are Foraminifera belonging to the genus *Nubecularia*, which occurs in enormous numbers growing on the *Posidonia* grass in Gulf St. Vincent. This genus is one of the Foraminifera found adherent to other organisms, such as Mollusca, particularly if broken, and sea weeds. The shells of adherent Foraminifera are usually of very irregular form, as the animal adapts the shape of its shell to that of the object upon which it is growing. With the white, irregular shells of *Nubecularia*, we will find other shells, in shape resembling a miniature *Trochus*, but glassy and of a rich brown colour, particularly towards the apex. These are more or less transparent, of very regular form, and with the surface perforated by innumerable small

holes. They belong to the genus *Discorbis*, probably to the species *Discorbis dimidiatus*, which is the most widely distributed and commonest of all Foraminifera in shallow water on the Australian coast.

In addition to the two Foraminifera I have mentioned, many others will usually be found, although the specimens will not be so numerous, nor will they be so large and conspicuous. Some of them, instead of having shells formed of lime secreted by the organism, as in the cases of *Nubecularia* and *Discorbis*, may have shells built of quartz sand, fragments of siliceous sponge spicules, or even of other Foraminifera, all cemented together by a cement secreted by the little animal.

Having seen the complex, many-chambered, beautifully-constructed test of a foram like *Discorbis*, we can be excused for thinking that the Foraminifera are related to the cephalopod, *Nautilus*. Indeed, the first students of the Foraminifera, including the famous Carl von Linné—or Linnaeus, as he is also known—regarded them as miniature *Nautili* and described them as such. It was later recognised that the divisions between the chambers—the septa—in the glassy-shelled forms, were perforated by a number of holes instead of being traversed by a continuous tube or siphon, as in *Nautilus*. They were therefore called Foraminifera—from the Latin words meaning “holebearers.”

Shortly after this, a Frenchman named Dujardin made the discovery that not only were the Foraminifera unrelated to the *Nautilus*, but that they were actually one of the simplest types of animal life, consisting of only a single cell. They are therefore protozoans, like the well-known *Amoeba*, but unlike it, form a shell. This shell may be formed of chitin only, but usually consists of lime secreted by the animal or of sand grains or other foreign material it has cemented together. The shells of the Foraminifera assume a great variety of shapes and are often exceptionally beautiful.

The living foraminiferal animal consists of a mass of the jellylike substance known as protoplasm, with a nucleus. The nucleus is inside the shell while the protoplasm occupies the remainder of the inside of the shell and also extends outside it, either

through the aperture of the shell alone, if the species is one of those with an imperforate shell wall, or—in the case of those with perforations in the shell wall—through both the aperture and the wall perforations.

The protoplasm outside the shell streams away from it in all directions in the form of very fine threads, known as pseudopodia, or "false feet," which are connected with one another at various points. These pseudopodia enable the animal, if it is not one of the adherent or fixed forms, to move slowly about, and they also catch the diatoms and other vegetable matter on which the forams feed. The majority of those studying the Foraminifera work on their dead shells alone and have never seen a living specimen. I must admit to being one of this number, as the two or three efforts I have made to secure living material have been unsuccessful. My friend and collaborator, Mr. Frederick Chapman, tells me, however, that anyone living near the coast will have no trouble in this direction. All that is necessary is a wide-mouthed jar—a glass jam jar will do—partly filled with sea water, and supplied with the material to be observed.

This material is obtained from the red and green seaweeds found in low tide pools. A few bunches of the weed may be shaken and washed in the jar, in which a few pieces of the weed should be left to keep up the balance of conditions. The sandy material coming from the surface of the fronds often largely consists of foraminiferal shells in the living state. In the day time, the living Foraminifera can be seen attached to the light side of the jar, with their pseudopodia extended.

If a little of the weed is placed in a stage aquarium specially constructed for the purpose, it can be placed under the microscope and the Foraminifera seen to better advantage. Viewed with dark-field illumination, living Foraminifera are stated by all who have seen them to be such beautiful objects as to turn the observer into an ardent and life-long student of this group of animals. Before I pass on to the next portion of this address, I would suggest that an almost certain source for living Foraminifera near Adelaide will be found in the *Posidonia* grass which is so abundant in parts of Gulf St. Vincent. The kind is the *Nubecularia* I described earlier and which will be found encrusting the stems and surface of the sea

grass, pieces of which must therefore be examined for it.

Partly because of the necessity of keeping the little animals alive in an aquarium for a considerable time, so that they can be constantly observed, the life history of the Foraminifera has been studied by only a few marine biologists. During the last few years, very great advances in this particular branch of study have been made in the marine laboratories at La Jolla (pronounced La Hoya), in California, and Villefranche-sur-Mer, on the Mediterranean coast of France. At La Jolla, Dr. Myers has done some remarkable work including the taking of a 2,000 feet motion picture film that faithfully portrays every significant phase in the life history of one species. Some of his conclusions are disputed by the French worker, Le Calvez, so the only aspect of the life history of the Foraminifera I will touch on is the phenomenon of dimorphism.

Any of those present who have been to Egypt and visited the pyramids have perhaps noticed that the pyramids are built of a limestone consisting largely of lens-shaped shells about an inch in diameter and perhaps a quarter of an inch thick. These are the shells of Foraminifera known as *Nummulites*—literally in English, stone coins. It was early noticed that the nummulites, which are widely distributed over the world and occur in countless numbers, were found together in two sizes—one very large and the other comparatively small. The small shells possessed a large central chamber, while the large shells had a small central chamber which was followed by a very much greater number of chambers than in the small shells.

It has been found that the two different shells belonged to the same species, the differences between the two being explained by the fact that one—the smaller shell—was the result of the splitting-up of an earlier animal by simple division to form a number of new animals. The large shell with the small initial chamber did not, however, originate in this way, but is the result of a conjugation or sexual process. As most of us are gardeners, I will turn to the garden for something to illustrate what happens. Carnations and also roses, for example, are raised in the first place from seed. They do not, however, come true from seed, and it is therefore necessary, if we want to in-

crease our number of plants, to take cuttings and strike them or, in the case of roses, we may also bud or graft them. In other words we increase them by division like the small Nummulites. Unfortunately, as we all know, there is, as the years pass, a gradual deterioration in the vigor of the variety and we are then obliged to sow seed and raise new, strong young plants. In the same way, there appears to be a gradual falling-off in the vigour of the foraminiferal animals after a series of increases by division has taken place, and Nature then provides for the rejuvenation of the species by a process akin to the raising of the carnations or roses from seed. { If you read any paper describing Foraminifera, you are sure to meet with references to megalospheric and microspheric forms. These are respectively the shells with a large initial chamber and those with a small one. I have a piece of limestone collected in Syria by a friend in the A.I.F. On one side of this will be seen a natural section through the centre of a microspheric example of a large Nummulite. It will be noticed that the initial chamber is too small to be visible except under a microscope. I would also direct your attention to the very large number of whorls or coils in the shell. If these are looked at carefully, you will notice that each whorl is divided up into hundreds of tiny chambers.

Among the Nummulites, we find the largest kinds of Foraminifera, one of them from Europe attaining a diameter of $4\frac{1}{2}$ inches. The shells of Foraminifera are, however, usually microscopic, averaging from about one millimetre to a quarter of this size.

Most Foraminifera live on the bottom of the sea, crawling slowly about on the top of the muds or oozes, or attached to various objects. There are a few species which have become adapted for a surface existence. These are mostly the *Globigerinae* which are found all over the world and the dead shells of which, falling to the ocean bottom, form the well-known *Globigerina-ooze*, which occupies millions of square miles of the sea floor.

Living specimens of Foraminifera are often beautifully coloured, the protoplasm varying from light pink to salmon to various shades of brown, while it may also be colourless. The shells themselves are, as a rule, not strongly coloured except in shallow water. Some tropical forms, such as *Homotrema*, which is found growing on the older parts

of corals on the Great Barrier Reef, are a beautiful rich deep crimson. Another, *Planorbulina rubra*, which occurs on the South Australian coast, frequently has shells of a delicate pink.

I have already briefly referred to the principal types of shell-wall found among the Foraminifera. Strictly speaking, the word "shell" is not correct, and the covering of the animal would be better referred to as a test, because it is not secreted by special organs as in the Mollusca. In addition to those with calcareous shells—(of which there are two sections—one with perforated walls and the other not perforate)—and the sandy shelled forms, there are rather rare forms with the test formed in some cases of chitin, and in other cases of silica, secreted by the animal. The various classifications of the Foraminifera which are used by the students of the group are all based in the first place on the nature of the shell wall. One section of the Foraminifera—the sandy shelled or arenaceous section—has always had a peculiar fascination for me. This is because of the remarkable ability shown by some of the species to select certain materials from the mass of debris on the sea floor and to use only these materials—and to use them in a special way—for the construction of their tests. Only a few of these can be mentioned. One is *Marsipella spiralis*, found in the North Sea.

This constructs its test of short fragments of siliceous sponge spicules, which are arranged spirally around a long, central axis and cemented together, so that the resultant test looks something like a twisted piece of string. Another species, *Psammosphaera parva*, typically constructs its globular sandy shell about the centre of a large needle-shaped sponge spicule, the ends of which protrude from either side. Another species, *Reophax spiculifer*, formed wholly of sponge needles, is found off the coast of Tasmania. Other species display a fondness for heavy minerals. I have seen specimens of a tiny form, with the name of *Proteonina tubulata*, dredged off the Antarctic Ice Barrier by Sir Douglas Mawson, in which the shell is formed almost wholly of garnets brought down from the Antarctic Continent by glaciers and deposited on the sea floor as a result of the melting of icebergs.

When we stop to think that the forams are single-celled animals, without any of the special sense-organs with which man is provided, is it not remarkable how these species I have been describing are able to exercise this power of selection? Much has been written as to how this power is to be accounted for, but the latest writer on the subject, Mr. Arthur Earland, has summed the present position up in the words of Omar, who—

" heard great argument
About it and about; but evermore
Came out by the same door as in I went."

While the Foraminifera so far mentioned have all been marine forms, there are a certain number which live in salt or brackish water away from the ocean. As far as I am aware, there are only two instances of this recorded. One of these is from salt pools in Hungary. The second is from springs in the desert of Kara-kum, in Central Asia, the latter waters being supposed to be the remnant of the sea which occupied the area millions of years ago. Coming nearer home, I may relate one of my own experiences in this direction. Just after the outbreak of the present war, Mr. W. Baragwanath, the Director of the Geological Survey of Victoria, who is always on the look-out for material which might interest me, brought back some lake weed from the shore of one of the salt lakes to the west of the Grampians, in Western Victoria. To my astonishment, the weed contained hundreds of specimens of a foram species which is usually found at the mouths of rivers where the influx of fresh water has lowered the salinity of the sea water in the vicinity. No fossil deposit containing this species and from which the specimens could have been washed out into the lake, was known in the district. In spite of this, the possibility of such a deposit could not be overlooked. I thought to myself that, if I could find living specimens in the lake the existence of the species there could be settled beyond doubt. I accordingly made the long journey to Douglas, only to find that during the interval of time which had elapsed between Mr. Baragwanath's visit and mine, the lake had dried up. The mystery of the presence of the apparently-living forams there is accordingly still unsolved. It has been suggested that the Central Asian species were originally transferred there on

the legs of sea birds, but it is not known whether forams can live for any time out of water. Should they be able to do so, transport by sea birds may account for their presence in the Victorian salt lake.

I will now tell you something of the distribution of the Foraminifera from two standpoints. The first of these is their geographic distribution. While up to the present, we have been dealing mainly with Australian Foraminifera, this is only because, placed as we are, they are of more immediate concern to us than any others. Actually, Foraminifera are found wherever marine conditions exist throughout the world, although, of course, there are differences in the species and assemblages wherever we go. With the Foraminifera, it can be said that temperature is the great controlling force, and depth, except as controlled by temperature, a much smaller factor. For this reason, we find that in the Tropics, certain species, generally sandy-shelled forms, will only be found at great depths, while the same species will occur in the Antarctic in comparatively shallow water.

In the warm, shallow waters of the Tropics, the Foraminifera are, as a rule, predominantly calcareous forms. In the vicinity of coral reefs, some species occur in such numbers as to form almost pure foram sands. The largest Foraminifera living are found in warm tropical seas with a depth of less than 30 fathoms. One of these is *Marginopora vertebralis*, whose white, flat, discoidal tests will be familiar to everyone who has been on the Great Barrier Reef. Other large, tropical, shallow water forams which are also common there belong to the genera *Alveolinella*, which has a long, spindle-shaped test, and *Heterostegina*, the shell of which is roughly ear-shaped and flattened, with the rectangular internal chamberlets visible from the exterior.

The Foraminifera occurring in shallow water on the coast of South Australia are all of a microscopic size and differ a good deal, according to my limited experience of them, from those found in Victorian waters. The South Australian species include a number which are typical of warmer water than that on the Victorian coast. Of these, I may mention *Nubecularia*, which I have told you occurs so abundantly in Gulf St. Vincent. Another is *Peneroplis*, which is illustrated.

One of the most remarkable forms is *Cribrobulimina mixta*, which is one of our living fossils and, if we want to find its ancestors, we must go to France, to the Eocene deposits of the Paris Basin. The study of the Foraminifera has shown that there have been migrations of faunas in Tertiary times. Perhaps the most striking of these, and certainly the one possessing most interest for us is the migration of the Eocene (Lutetian) fauna of the Paris Basin and southern England through the Mediterranean region to Australia. Many of the species of the European Eocene are found but little changed in the Miocene of Australia and, even in some cases, in the recent material from the Australian coast. What makes South Australia so important to the student of these problems is that it appears to have been the southern limit of this migration. Its shallow water Foraminifera are therefore deserving of the closest study. Leaving shallow water on your coast, and passing southward over the continental shelf, we notice a gradual change in the Foraminifera, as the depth increases. Between Australia and the Antarctic continent, very deep water is encountered, with depths of up to 2,000 fathoms. Here, as elsewhere under similar conditions, the sea bottom consists largely of the *Globigerina*-ooze.

When we reach the continental shelf surrounding Antarctica, we find that the character of the foraminiferal assemblages encountered is quite different from any of those already referred to. The lower temperature of the water is probably responsible for this. While Foraminifera are surprisingly abundant and often of very large size, they are predominantly of the sandy-shelled types. Calcareous types, both perforate and imperforate, are also common, but the specimens being smaller, form a comparatively small percentage of the bulk of the Foraminifera present in the sample. One of the largest of living, sandy-shelled Foraminifera, *Reophax nodulosus*, is found in this area.

All I have said on this merely illustrates what is already familiar to you as students of the Mollusca—namely, that each area is characterised by its own particular assemblage and, after some experience, we can tell, except in the case of the deep-water *Globigerina*-oozes, fairly accurately where an unknown sample comes from. Of course, this applies as much to fossil faunas as to living ones.

Living Foraminifera have not, as far as I am aware, any interest for anyone other than the scientist, or the microscopist who is attracted by the beauty of their forms. Fossil Foraminifera are, however, of very great economic importance and you may therefore like to hear something of them and their use to man. The earliest Foraminifera known were described by Mr. Frederick Chapman from limestones of Cambrian age in England, and we have since had a species in the Cambrian limestones of Curramulka, in South Australia. Foraminifera did not, however, become common until the period during which the great British deposits of coal were formed. They then appeared in great variety and immense numbers, the members of a now extinct family, the *Fusulinidae*, forming extensive deposits of limestone. These limestones occupy large areas of North America, Europe, and Asia, and extend down through the East Indies to the Kimberley region of North West Australia, from which they have been recorded by Mr. Chapman and myself.

Deposits of *Fusulina*-limestone are even found within the Arctic Circle, on the Island of Spitzbergen, and they are common in Japan. The many different varieties of these fusulines are most useful to the geologist, as each one lived for only a short period, and they are therefore valuable in enabling the age of any rock in which they occur to be determined.

When we come to the rocks forming the Mesozoic or Secondary Era of geologists, many of the Foraminifera are like those of the present day. It was in this period that the chalk forming the white cliffs of Dover was laid down. Until very recently, it was generally believed that chalk was composed almost entirely of Foraminifera, but it has now been proved that the percentage of Foraminifera in chalk does not exceed ten per cent. of the bulk of this rock.

Passing into Tertiary times, we reach the Golden Age of the Foraminifera. They then reached their maximum development both as regards size and abundance, and their remains formed great beds of limestones extending across whole continents and often of enormous thickness. These limestones include the nummulitic limestones, of which, as I have told you, the Pyramids are built.

Actually the first forams ever recorded were nummulites, from near the Pyramids. The peculiarity of their remains struck the

ancient geographer Strabo, who accounted for their presence in the limestone by asserting that they were the petrified remains of lentils from the rations of the workmen employed in building the Pyramids!

The nummulitic limestones spread in a more or less continuous broad band from the Pyrenees across Europe, Northern Africa, and Asia, to the Himalayas, attaining a thickness of several thousand feet. It is not surprising that papers have been written on the role played by the Foraminifera in the building of the world of to-day.

The nummulites have long been extinct, but others kinds of Foraminifera have taken their place as rock-formers. The only State in Australia in which rocks formed almost wholly of Foraminifera are found is, I believe, Victoria. Visitors to Melbourne have noticed the unusual architecture—Norman in style—of the building immediately north of the National Museum, in Russell Street. This is the City Court, which is constructed of limestone, formed almost wholly of myriads of the tiny tests of another extinct genus of Foraminifera, with the name of *Lepidocyclina*—literally, in English, scaly wheels, from the rough exterior of the discoidal shell.

So far, I have dealt with the fossil Foraminifera from the point of view of their use to us as sources of building material. Their greatest value to us is, however, in the part they play in the search for oil. It may surprise you to know that every important company engaged in oil search employs one or more experts who have been trained in the use of Foraminifera to find whether conditions favorable to the occurrence of oil are present. The value of Foraminifera for this work was discovered only within the last twenty years. It is based on the fact, so well known to all geologists, that once the fossils characteristic of the various strata are known, a geologist can, if set down in any part of the country, readily determine on which bed in the geological series he is standing, if only he can find a few fossils.

Much of the data on which the oil geologist must base his opinion, as to whether oil is likely to be found in a particular area, is obtained from samples of the underlying rocks brought up to the surface by drilling plants, like that now operating at Nelson, in

South-western Victoria. In the majority of cases, the only fossils which are common in these bore cores are Foraminifera. They are also so small that, no matter what method of drilling is used, many of them escape injury during the boring and they can therefore be recognised by the foram-expert, or micro-palaeontologist, as he is known. He washes down each sample by the method I shall describe to you later, and then identifies the Foraminifera. All differences are noted, and the skill of these men is so great that, after having examined 2,000 samples, taken from 10,000 feet of bore cores, one of them, Dr. J. A. Cushman, the greatest authority on the Foraminifera, was able to recognise the exact position of ten of the samples which were given to him later without particulars where they had come from. You will understand how it is possible, from the study of the Foraminifera in the cores from a number of borings in an area, to tell the position of each stratum in each bore and by this means determine whether the rocks are folded or tilted and generally whether the right kind of geological structure for the occurrence of oil is present. In a broadcast talk, Dr. Cushman compared the micro-palaeontologist with a person travelling in a lift to the top of a sky-scraper. The lift-traveller recognised where he was by the floor numbers. Similarly, the micro-palaeontologist was able to tell what position he was in, geologically, by reading the "floor-number" with which the Foraminifera supplied him.

I have said more than I should have done on the geological side of the Foraminifera.

I hope you will pardon me for this, remembering that I have done much more work on the fossil species than on the living ones.

However, before I pass on to the practical side of my talk, I should like to tell you something which will give you some idea of the importance of the Foraminifera in the search for oil. We all have read of the severity of the financial depression of the nineteen-thirties in the United States of America. Millions of people lost their employment. These included great numbers employed by oil companies, but in spite of this, every oil company took care not to put off one of its micro-palaeontologists.

*Collection and Preparation of
Material.*

I shall now deal with the collection and preparation of foraminiferal material, dealing first with recent material.

I have already mentioned how Foraminifera occur on the beach at Glenelg. On coasts with shallow water which have many algae (for example, the *Posidonia* grass of Gulf St. Vincent) or hydroids, the shells of Foraminifera often come in on the beach in enormous numbers. At Altona Bay, near Melbourne, I have seen parts of the beach inches deep in Foraminifera. There are few sandy beaches on which they are not present, but in most localities they do not occur in sufficient numbers to be worth collecting. It will also be found that a spot which, on one visit, has been very rich may, on the next visit, be almost without Foraminifera. As an example of this, I may mention Barwon Heads, just outside Port Phillip Heads. A friend has collected foraminiferal sands from the same spots there every Christmas for the last ten years. Some of the gatherings have been so poor as to be scarcely worth looking at, while others have been exceptionally rich, so rich that Barwon Heads can be said to have the largest number of species, well over 200, known from littoral gatherings. It will also be found that some gatherings made at a locality contain many rare species which are absent from other collections made there.

These differences are, of course, due to the conditions prevailing at the time each collection was made. Heavy seas or the set of the tidal currents will affect the nature of the gatherings, and also where the material will be found on the beach. We must not therefore be disappointed if we do not find Foraminifera where we found them previously. What we should then do is to move along the beach following the drift of the beach currents. We will probably find that the foraminiferal material has been concentrated against some other small point or projection which has checked the movement of the water and caused the deposition of the Foraminifera which have been carried along by the waves.

Having found our gold-bearing material, the next thing to do is to collect it. The apparatus required for this is very simple.

The essentials are something with which to scrape the material up and something in which to place it. A large spoon will do to scrape ripple marks and the lid of a tobacco tin makes a good scraper for the more level surfaces. The material collected can be placed in a tobacco tin and labelled with the place and date of collection. It should not be left for any time in the tin without being washed and dried, otherwise the salt will soon corrode the tin and the rust will damage any Foraminifera with which it comes in contact.

If material is plentiful and reasonably dry, it can be put into strong paper bags, or, if wet, into cloth bags.

Sometimes it will be found that the Foraminifera are not present in sufficient numbers to enable them to be collected without scraping up a much larger amount of sand. In this case, the greater part of the sand can be got rid of on the spot by adopting a process akin to that followed by gold miners in panning off with a gold washing dish. A small enamel or aluminium pie-dish or a photographic developing dish with a lip at one corner is suitable for the purpose. The dish is nearly filled with sea water and a handful of the sandy scrapings is then placed in it. By gently shaking and rotating the dish, the Foraminifera, being lighter than the sand, will come to the surface and can be concentrated at one corner of the dish. From here they can be poured off into a cloth bag, which will strain off the water. If a tin is used as a container, some sort of strainer will be necessary to get rid of the water. A piece of fine cloth, say a handkerchief, will do.

Having become acquainted with the forams found on the beach, it will not be long before we wish to know something of those in deeper water. From experience recently gained in attempting to bail the water out of my A.R.P. dugout, I would advise anyone using a bucket to fasten half a brick to the bucket handle so as to keep the top of the bucket down.

Earlier workers on the Foraminifera obtained much of their material from the mud off ships' anchors, collected for them by seamen. This method of securing material is not so often heard of nowadays, but some years ago, when the yacht "Utiekah III" made a cruise around the south-west Pacific, a friend who was on board collected a most interesting series of anchor muds for me.

When we come to really deep water, samples of the sea bottom can only be obtained by ships which are properly fitted up for the purpose. The expeditions to the Antarctic under the leadership of Sir Douglas Mawson have dredged large quantities of material, some of which has already been described by Mr. Frederick Chapman and myself. We are now engaged on that obtained by his expedition of 1929-1931.

Having secured our foraminiferal material, we must now clean it. Several methods have been advocated, but the essentials are the same. In the first place, the material is slowly dried. Too much heat will cause the Foraminifera with glassy tests to become opaque and they will lose much of their beauty. It must then be washed. The method I follow is to put the dried material into a basin (or for preference—if there are no household objections—an aluminium saucepan, as it has a handle), and then add water. It will usually be seen that the lighter Foraminifera, because of their being filled with air, float to the surface and adhere to the sides of the container. They are the most perfect specimens and can be removed by means of a camel's hair brush on to a saucer and then gently dried. My practice is, however, to pour the water off through a fine sieve of 80 meshes to the inch, and catch the Foraminifera in this way. With muddy material, some of the Foraminifera may be very small and a finer mesh may be necessary. For this reason it is advisable to catch the material which passes through the sieve and, after allowing it to settle, dry and examine it to see whether any Foraminifera are in it.

After the water has been poured off, more is added and decanted through the sieve, this being continued until the water being poured off is clean. Our material is then ready for drying.

Fossil materials are prepared in much the same way. In South-eastern Australia, Foraminifera are usually found in clays, marls, or limestones. The clays and marls should be broken up into small lumps, thoroughly dried, and then dropped into water, where they should be allowed to remain for some time. It will then be found that the material has disintegrated into a fine, silty mud which can be readily washed away by the decanting method I have just described, leaving a sandy residue consisting of Foraminifera, ostracods, and other minute organisms, and mineral grains. The fossil Foraminifera in this area are most beautifully preserved and, unlike fossil Foraminifera in most parts of the world, many of them are air-filled and will float like living Foraminifera.

In dealing with very sticky clays or with shales, the disintegration of the material will be facilitated if it is first boiled with common washing soda before washing is attempted.

Having washed our material, we are now ready to see what forams it contains. The specimens which floated and were removed with the brush or caught by the sieve will be the first to be examined, for this portion of our sample will be frequently almost pure Foraminifera without any admixture of sand. With the forams there will probably be ostracod tests and often fragments of Bryozoa. As I mentioned earlier, the forams found in the floatings are usually the most perfect specimens. They consist in most cases of delicate glassy-shelled forms or white tests of the porcellaneous group. The sandy-shelled species are usually too heavy to float on the surface of the water.

The cleaned and dried sandy residue after washing consists of the heavier Foraminifera, broken tests of others which would not float, ostracods, Bryozoa, and other organisms as well as a proportion of sand. Several methods have been suggested to concentrate the Foraminifera and so avoid the labor of searching through large quantities of sandy material. The "panning-off" process with sandy beach material has been described earlier. There is, however, a much better method of mechanical sorting now available for washed material. This was worked out

by Dr. Ozawa, and involves the use of carbon tetrachloride, which, as it has a specific gravity of 1.6, as against 1 for water, will lift air-filled Foraminifera which will not float in water. The material must first be carefully washed and dried and then any fine material taken out with a 200-mesh sieve.

The sample is then placed in a dish and ordinary commercial carbon tetrachloride poured over it. The Foraminifera and ostracodal tests will at once float to the surface and may be retained by pouring the liquid through chemist's filter paper inserted in a glass funnel into a container beneath. As a substitute for the filter paper, ordinary fine cotton cloth may be used. The carbon tetrachloride left on the filter evaporates very quickly and the separated specimens are dry in a minute or two. The residue left in the dish will also soon dry. It should then be examined to see if any forams are left in it, particularly if fossil material is being dealt with, as fossil specimens may be infilled with some mineral which prevents their floating. The tetrachloride passing through the filter should be bottled up without delay as it evaporates quickly. It can be used over and over again. It should be remembered that carbon tetrachloride, like chloroform, to which it is related, evaporates at ordinary temperatures and its fumes are anaesthetic in their effect. It is therefore advisable to work with it near an open window, the draught from which will carry away the fumes and enable it to be used with safety. I should also tell you that carbon tetrachloride is at present "frozen" by the Commonwealth Government under the National Security Regulations, as supplies are short and they are required for essential work. It cannot therefore be obtained until the present restrictions are removed.

The first essential for the study of the forams is, of course, a microscope. High magnifications are not necessary, and indeed actually hinder working. For most work, a magnification of from 30 to 40 diameters is sufficient. The best medium for mounting forams on the slides is gum tragacanth. This can be bought either in lump form or as a powder, and is then dissolved in warm water to form a consistency suitable for the specimens to be mounted. A drop or two of formaldehyde may be added to the dissolved gum to avoid the growth of moulds which sometimes occur

on the slides. The gum is used by spreading a thin coating over the slide with a brush before commencing mounting. When it has dried, the mere placing of the specimen on the slide by means of the moistened brush will usually be sufficient to hold the specimen in position. Should, however, the specimen be large it may be found necessary to use additional tragacanth. The gum need not be used too sparingly in mounting, as it contracts and disappears in drying. Another advantage of tragacanth is that it has no glaze and the specimens can readily be removed by moistening them with a wet brush. It is hoped that these remarks upon one of our most interesting groups of marine organisms may awaken in some of my readers a desire to make a study of them.

South Australian shallow water areas offer a rich field for research. The late Professor Howchin, in 1890, recorded a number of unusual species which have not since been met with, from the vicinity of the Port Adelaide River. If the localities have not been effected by the march of progress, dredgings from them would provide valuable data for a comparison with the records of 50 years ago. Finally, there is an unsolved problem which needs the attention of some local worker. There are some peculiar forms—survivals from the Tertiary migration from Europe I referred to earlier—which occur in the sandy beds, of Upper Pliocene age, in the borings around Adelaide. While most Upper Pliocene species of Foraminifera are also found living, it is remarkable that these Adelaide species are known only as fossils. I cannot help thinking that they will be found living in shallow water on a sandy bottom in Gulf St. Vincent, close to Adelaide.

The illustrations on the cover represent some common South Australian types of Foraminifera which can be found at the edge of the tide on the sandy beaches at Semaphore and other places in Gulf St. Vincent.

SEA ANEMONES

By

BERNARD C. COTTON and FRANK K. GODFREY

"Sea-anemones" is a popular name for those marine radiated animals which present some resemblance to the Anemone, but really look more like the Chrysanthemum or some others of the *Compositae*.

The Sea-anemone is a polyp, formed on the same general lines as the *Hydrozoa*, but differing in having numerous tentacles arranged in multiples of six, and in the absence of a hypostome, the mouth being nearly flush with the surface of the disc. Its great size and bulk, and the comparative firmness of its substance, are also striking points of difference between Sea-anemones, which rank in class *Actinozoa*, and the polypes belonging to the class *Hydrozoa*. They all belong to the phylum *Coelenterata*, which also includes the Corals and the Jelly-fishes large and small.

Habitat. Sea-anemones are found attached to the upper surface of rocks; in rock pools uncovered only at very lowwater; in holes or crevices of overhanging rocks, or in a cavern; or on the broad leathery fronds of kelp. (Some are fond of crevices and places where gravel and broken shell accumulate, and beneath these the individual buries its base, and attaches bits of shell and stone to the many whitish suckers, with which the upper part of its column is studded, and when the tide retires and leaves it, one has to look not for an expanse of brilliant tentacles, but for a little rounded heap of gravel.)

One particular species, in the daytime, compresses itself into a dirty yellow button, a few millimetres in thickness. In this condition it might be taken for a small limpet shell or a flake of rock. At night the depressed yellow button has gone, and there stands a tall and elegantly formed column, two inches in height, supporting a crown of many transparent tentacles.

Other species are so small that an adult hardly exceeds six millimetres in height, and

the breadth a little more. Some such tiny representatives may be found associated in colonies of up to fifty individuals. The species may be variable in colour, but the members of one colony may be expected to resemble each other very closely, in this as in other respects.

At low water one sees upon a rock a group of dumpy masses of clear white jelly. If these are removed to a collecting jar, and in the evening, when they have had time to recover from the shock, they will astound the beholder. The squat jelly-lump erects itself into a shapely alabaster column, a couple of inches high, and near the top a rounded parapet, above which the lobes of the crown will spread out, densely clothed with feathery tentacles.

The shells of hermit crabs are a common abiding place for certain species. It is not clear what are the advantages to the commensal partners. It is, however, probable that the Sea-anemone derives advantage from being carried about from place to place, and so has better opportunity for securing food than if stationary; whilst the crab is probably saved from being swallowed by a big-mouthed fish, owing to the unpleasant odour of the Sea-anemone. It has been noted that the base of the Sea-anemone gradually absorbs that portion of the Gastropod shell to which it is attached.

On the Great Barrier Reef, the large Sea-anemones of genus *Discosoma*, are found associated with small Fishes or Crustacea, which seem to have their abode in the enteric cavity but how they avoid the fate of the prey of the Sea-anemone is not known. Some of these gigantic *Discosoma* attain a diameter of two feet.

Perhaps the most remarkable association of a commensal kind is to be seen in the case of

the little shore crab of the Indian Ocean (*Melia tessellata*), which invariably holds in each of its large claws a small Sea-anemone.

Observers relate that when the Crab is robbed of its Sea-anemone, it appears to be greatly agitated, and hunts about on the sand in the endeavour to find it again, and will even collect the pieces, if the Sea-anemone is cut up, and arrange them in its claw.

Distribution. Sea-anemones are found the world over, and in many cases the same genera are found in widely separated parts.

The larger, and those of more varied form and colour, are mostly found in tropical regions. Most are littoral, living either between tidemarks or at slight depths; a few are pelagic, and some species have been dredged from depths down to nearly 3,000 fathoms.

Description—Exterior. A Sea-anemone is an animal having a body of a more or less columnar shape, terminated at the lower extremity by the base or pedal disc, and at the upper extremity by the oral disc which bears the tentacles, enclosing the mouth.

The entire quantity of solid matter in a Sea-anemone is very small, as may be seen in those species that become exceedingly thin and flat in the day-time, but expand into a tall, graceful column at night. In a similar fashion the tentacles are constantly withdrawn by becoming very small; and the full expansion of these and the column is alike effected by the absorption of much water. A consideration of these facts will make it easily understood that Sea-anemones are much more abundant than is generally recognized.

Attachment to a rock or other support is by means of a sole-like broad *base*, usually sharply separated from an upright cylindrical wall or column, and sometimes beset with rows of adhesive warts or tubercles. Some species have a rounded base which is thrust down into sand, and there retained by inflation. Sea-anemones can move on this base, much after the manner of a snail, but more slowly. Some constantly inflate the base to such an extent that it becomes a swimming bladder, buoying them to the surface of the water, along which they float inverted.

The *column* at its upper or distal end passes into a horizontal plate, the *disc*, or *peristome*.

In the middle of the disc, and slightly elevated above its surface, is an elongated slit-like aperture, the *mouth*, from which streaks of colour radiate outwards. Springing from the disc and encircling the mouth are numerous *tentacles*, which are usually arranged in multiples of six (occasionally five), in a number of *circlets*. Supposing the innermost circlet to contain six, the second also six, the third may number twelve, the fourth twenty-four, the fifth circlet (if present) forty-eight, and correspondingly increased if a sixth circlet is in evidence. Totals of 400 to 500 tentacles are sometimes, but rarely found. The tentacles are usually simple, unbranched, hollow cones, an extension of the body wall and vary greatly in length.

Enteric System. The mouth does not lead at once into a spacious, undivided enteric cavity, but into a short tube, having the form of a flattened cylinder, which hangs downwards into the interior of the body, and terminates in a free edge (bottomless), produced at each end of the long diameter into a descending *lobe* or *lappet*. This tube is the *gullet* or *stomodaeum*, whose inner surface is marked with two longitudinal grooves corresponding with the lappets, the *gullet grooves*.

The stomodaeum does not simply hang freely in the enteric cavity, but is connected with the body wall by a number of radiating partitions, the complete or *primary mesenteries*. Between these are incomplete *secondary mesenteries*, which extend only part of the way from the body wall to the stomodaeum, and *tertiary mesenteries* still more limited in their extent. Mesenteries may be traced in some genera to the sixth order.

The usual arrangement of the mesenteries is hexamerous, i.e., that there are six primaries.

In most cases also there are six secondary and twelve tertiary mesenteries. After the tertiaries have been formed, only two of each succeeding group appear in each sextant, so that the arrangement of a sextant containing mesenteries up to the fifth order would be as follows:—

1 4 3 5 2 5 3 4 1

The mesenteries are often perforated by foramina or stomata, which serve to promote the circulation of fluid along the chambers of the body cavity.

Thus the enteric internal cavity of a Sea-anemone is divisible into three regions: (1) The stomodaeum or gullet, communicating with the exterior by the mouth, and opening below into (2) a single main digestive cavity, the *stomach* or *mesenteron*, which gives off (3) a number of radially arranged cavities, the *inter-mesenteric chambers* or *metentera*. *Cell layers*. The body wall (base, column, and disc) consists of a layer of *ectoderm* (outside), one of *endoderm* (inside), and between them an intermediate layer or *mesogloea*, which is extremely thick and tough.

The stomodaeum is an inturned portion of the body wall, is lined with *ectoderm*, and its surface which faces the intermesenteric chambers is endodermal.

The mesenteries consist of a supporting plate of *mesogloea*, covered on both sides by endoderm.

The tentacles are hollow out-pushings of the disc, and contain the same layers.

Muscular System. { Sea-anemones perform various characteristic movements: the column may be extended or retracted, the tentacles extended to a considerable length, or drawn back and completely hidden by the upper end of the column being folded over them, like the mouth of a bag; the stomodaeum, and even the mesenteries, may be partially everted through the mouth; and lastly, the whole animal is able, very slowly, to change its position by creeping movements of its base. These movements are performed by means of a very well developed set of muscles.

Attack and Defence. Stinging capsules occur in the ectoderm, and are also abundant in the mesenteric filaments. They resemble in general characters the nematocysts of *Hydrozoa*, but are more elongate, and the thread is usually provided at the base with very numerous slender barbs. Gland cells are abundant in the ectodermal lining of the

stomodaeum and in the mesenteric filaments. In possessing both stinging capsules and gland cells, the mesenteric filaments perform a double function. The animal is voracious and is able to capture and swallow small Fishes, Molluscs, Sea-urchins, etc. The prey is partly paralysed before ingestion by the stinging capsules of the tentacles, but the process is completed after swallowing, by those of the mesenteric filaments. Then, as the captured animal lies in the stomach, the edges of the filaments come into close contact with one another and practically surround it, pouring out, at the same time, a digestive juice secreted by their gland cells.

Reproduction. Sea-anemones are dioecious, the sexes being lodged in distinct individuals.

The gonads—ovaries or testes—are developed in the substance of the mesenteries, a short distance from the edge, and when mature, often form very noticeable structures. The sperms, when ripe, are discharged into the stomach and escape by the mouth; they are then carried, partly by their own movements, partly by ciliary action, down the gullet of a female, where they find their way to the ovaries and impregnate the eggs.

The oosperm undergoes more or less regular division, and becomes converted into a *planula*, an elongated ovoidal body with an outer layer of ciliated ectoderm, and an inner layer of large endoderm cells, surrounding a closed enteric cavity, usually filled with a mass of yolk, which serves as a store of nutriment.

In this condition the embryo, usually opaque white, escapes from the parent through the mouth, swims about for a time, the aboral end foremost, and then settles down, becoming attached by its broader or anterior end. At the opposite or narrow end a pit appears, the rudiment of the stomodaeum, and so on to tentacles and mesenteries.

In a considerable number of species the fertilization of the eggs and their subsequent development take place in sea water. In many others the embryos are discharged into the water from the body cavity of the parent, with six or twelve tentacles already developed.

Under natural conditions the sexual condition is seasonal, but Sea-anemones when kept in an aquarium and regularly fed, may be expected to breed nearly all the year round.

Asexual reproduction is apparently not a common occurrence but there are many known instances. Longitudinal fission occurs; also transverse fission when the body of the Sea-anemone becomes constricted in the middle, a circlet of tentacles is formed below the constriction, and division takes place. The upper half floats away with the original tentacles and stomodaeum, and becomes attached by the base in another place. The lower half remains behind and develops a new stomodaeum and other organs.

In some species a form of asexual reproduction occurs known as pedal laceration. The pedal disc spreads on the rock upon which the animal rests, in the form of a thin membrane or film of an irregular circular shape, nearly twice the diameter of the column. As the Sea-anemone glides along, the film remains behind and breaks up into a number of hemispherical droplets, which, in a very short time, develop tentacles, a mouth, mesenteries, and other organs. They may also reproduce by gemmation, the buds appearing either on the disc or the base.

In the development of the Sea-anemone there is no alternation of generations, as we find in so many of the *Hydrozoa*. They exist only in the polyp form, no medusa stage being known in any member of the class.

Food. On the continent of Europe a dish called *Rastegna* is mainly prepared from certain species of Sea-anemone. Perhaps some of our local enthusiasts would like to experiment; in that case we should be glad to have their experience and candid opinion on the suitability of our native forms for human food.

Aquarium. Sea-anemones undoubtedly make really charming pets. In the eighties of last century there died a Sea-anemone which had lived sixty-six years in an aquarium in Scotland, and specimens are still living which are known to be almost as old. The average life of a Sea-anemone on the rocks in a state

of nature, is probably not more than thirty years and perhaps a good deal less.

Many species adapt themselves to the artificial life of an aquarium very readily, and without any great exhibition of shyness. For this purpose it is better to take medium size specimens, rather than to look for the largest example, as they are less likely to be injured by removal. Examples attached to small stones are to be preferred to disturbing the attachment of others. They are not great consumers of oxygen, and consequently the water in the vessels does not readily become fouled, except as the result of feeding.

Do not give food more than once in a fortnight or ten days, but be sure it is suitable food, and in small fragments only. Cockles and mussels, both are plentiful, tiny pieces uncooked, are an ideal food. Fish that is hard muscle is quite unsuitable, for they cannot readily digest it. They require so little that we may well select what is known to be easily digestible. Of course, a piece out of the side of a young whiting would be most acceptable.

The nutriment extracted by a Sea-anemone appears to be entirely of a fluid character. They suck the juices from it, and having done so completely, what remains becomes pearly white, and having been wrapped in a thick transparent glaire, is thrust out by the way it entered. Now this excrement is of a very objectionable character, and if allowed to remain for a short time will infect the whole of the water in the vessel, and begin to destroy all the life therein: so it must be removed at once.

Should a rock be selected to serve as a residence in the aquarium, let it be pitted with holes and recesses into which the more retiring species may withdraw their columns. If green weed is attached it will be quite suitable, but beware of thick-fronded leathery olive weeds which soon begin to decay and melt in slime.

To convey Sea-anemones from the sea to a distance, it is best to wrap them lightly in some of the finer seaweeds, and put them in a weed-lined box. This is better than carrying them in water.

SEA HARES

By G. PATTISON.

On March 3rd, 1942, while at Port MacDonnell, South Australia, searching for marine life, I observed on flat reefs at low water several dozens of Sea Hares, *Tethys gigantea* Sowerby, a species hitherto recorded only from the Swan River, Western Australia. The largest specimen was 300 mm. (12 inches), and the average 200 mm. in length. They apparently mate at this time of the year. The animal is a rich sepia in colour, and a fringe extends along the back for three-quarters of the animal's length. On being picked up a copious supply of rich purple fluid was exuded, covering my hands and arms. This discharge continued after the return to the water, evidently coming from certain pores situated at each side of the mouth, underneath. The fluid seems to act as a smoke screen. It was once thought to be poisonous, but that is not so. The shell set in the middle of the back is convex, translucent, flexible when alive, curving in at one end and about 60 mm. long and 40 mm. wide. It is thinner and more fragile (when dry) than the smaller Sea Hare, *Tethys norfolkensis*. The animal is graceful in action, and the contours of its body are constantly altering. The tentacles are retracted and protruded frequently, and it would certainly make a "star turn" for a motion picture film.

The Sea Hare ate weed, vegetable matter, and the guts of fish which I left in rock pools.

There is a smaller Sea Hare, *Tethys norfolkensis*, which I have taken in the South-East, Kangaroo Island, and St. Vincent Gulf, South Australia. This has the same habits as *T. gigantea*, but the small shell on its back is quite different. It is brown, thin, highly arched, elongated triangular shape, coming to a beak at one end. The shell is about 20 mm. long, 15 mm. wide, 8 mm. deep. The name "*Tethys*" given to this weird, grotesque slug of the sea has certainly its humorous side. "*Tethys*" in Greek mythology was the beautiful wife of Oceanus, and the Mother of the River Gods. There is a good description of this animal and shell by B. C. Cotton and F. K. Godfrey in the "South Australian Naturalist," May, 1933. The animal is 40 to

60 mm. long, dark brown, sometimes spotted lighter colour or whitish dots, very often black on the fringes of the lobes. The purple fluid given off by this smaller species is less in proportion than the amount ejected by *Tethys gigantea*. These animals make a fine study subject in an aquarium.

I have to thank Mr. B. C. Cotton for the identification of the Sea Hares here recorded.

The Southern Bailer Shell

The large Bailer Shell, *Melo miltonis*, is rarely taken alive by South Australian collectors. It appears to be fairly common,



however, in the Great Australian Bight. The photograph shows eight living specimens, ranging from nine to twelve inches in length, taken by E. T. Wheare at Cape Thevenard in one and a half fathoms. They are now in the South Australian Museum collection.

—B. C. COTTON.

Notes On Some South Australian Bats—No. 1

By

E. F. BOEHM

Sutherlands, S.A., 31/1/1942.

Little Brown Bat (*Vespadelus pumilus pumilus*, Gray 1841).—Although this diminutive dusky-brown bat is said by Wood Jones ("Mammals of South Australia," p. 423; 1925) to be by no means common, it is relatively numerous in the semi-humid areas of South Australia, where the savannah woodland and sclerophyll forest formations are found. The size-variations noted by Wood Jones appear to be partly due to age. Examination of a long series of specimens, with the length of the forearms ranging from 28 mm. to 33 mm., indicates that the smaller, less brownish individuals are sub-adult, and that the larger, brown, or rufous-tinged examples are aged individuals.

At Bool Lagoon, South-east South Australia, Mr. J. B. Hood discovered a colony of forty in October, 1934. They were observed by him at dusk, emerging from a crack in the trunk of a dry hollow Yellow Box (*Eucalyptus* sp.), about eight feet from the ground. Leaving the tree at the rate of one per minute, the bats dropped towards the ground before flying off. Only one male was found in the colony.

Gould's Wattled Bat (*Chalinolobus gouldi* Gould, Gay 1841).—Flying early in the evening, Gould's Wattle Bat appears on the wing in our mallee areas the whole year around, excepting in very rough or wet weather. Occasionally one may be seen as early as sunset in summer time, when it is still light enough to distinguish the chocolate-coloured throat, blackish head, and short, characteristic ears. Rarely one is observed flying about in the morning as late as a quarter of an hour after sunrise.

Large examples are often of a blackish colour. In these specimens the dorsal surface is blackish, shading off to very dark rusty-brown on the extreme lower back, while on the ventral surface the gradation

is from very dark rusty-brown to dark grey. Small communities of from six to ten individuals occupy a suitable hollow tree trunk, or bough, in most patches of scrub in the mallee districts.

Peters' Free-tailed Bat (*Micronomus planiceps*, Peters 1866).—Described by Wood Jones under the name of *Nyctinomus petersi*, Leche 1884, this bat is apparently not uncommon in South-east South Australia, and its occurrence in South-western Victoria is to be expected. A colony of thirty-one was found at Bool Lagoon, S.A., on 21st October, 1933, by Mr. J. B. Hood. They were in the hollow limb of a ring-barked Hill Gum (*Eucalyptus* sp.), eighteen feet up from the ground. The animals generally moved backwards and were very active. A small heap of excreta was situated directly below the entrance of the hollow, and the inside of the limb had a smooth and greasy appearance, which seemed to indicate that the situation was a permanent camping place.

The colony comprised six males and twenty-five females.

CORRECTION.

The last issue of this publication had on the cover Vol. 22, No. 1. This is incorrect, and should read Vol. 21, No. 2.

The Secretary is preparing a list of members. Will you write in, giving name, address, and date of joining the F.N. Section?

BARRETT'S LAND SHELL



The accompanying picture, taken by Captain Graham and forwarded to me by E. T. Wheare, shows an extraordinarily numerous colony of the Native snail, *Bothriembryon*

barretti. The shells are situated in sandhills near the head of the Great Australian Bight, due north of Twin Rock.

B. C. COTTON.

List of Plants on Fleurieu Peninsula

By

J. B. CLELAND AND C. M. EARDLEY.

In June, 1930, one of us (J.B.C.), through the courtesy of the then Conservator of Forests, Mr. E. Julius, accompanied by Mr. A. L. Pinches, had an opportunity of spending a few days in the Second Valley Forest Reserve.

Considerable additions to the list of plants then obtained were made during the visit of the Tate Society of the University of Adelaide in December 1938, whose camp was situated on Deep Creek about a mile south of the Reserve. Excursions were made from this site to various portions of the rough, scrub-covered hills and valleys between the ridge road and the southern coast-line.

The Fleurieu Peninsula area may be considered as comprising the country south of

the Inman Valley-Yankalilla-Normanville Road, separated on the east by the Bald Hills and the Tunkalilla Road from the Encounter Bay district. Torrens Vale is thus included in the Fleurieu Peninsula area. Most of the plants in the following list were obtained during the two expeditions mentioned, but a few are included that had been collected at other times within the area defined as the Fleurieu Peninsula.

A total of 301 species and one variety in addition appear in the list, 40 of which are introduced species.

Mr. J. M. Black has kindly identified various species, and most of the Cyperaceae have been identified by Mr. S. T. Blake.

FILICALES:—*Lindsaya linearis* Swartz; *Adiantum aethiopicum* L., Maidenhair; *Cheilanthes tenuifolia*, Swartz; *Pteridium aquilinum* (L.) Kuhn., Bracken; *Blechnum discolor* (Willd.) Keys; *B. capense* (L.) Schlecht.; *Dryopteris punctata* (Thunb.) C. Chr.; *Gleichenia circinata* Swartz, Coral Fern, Deep Creek; *Schizaea dichotoma* Swartz, under tall sedges in drying swamp just to the west of and three miles along the road to Tunkalilla.

TYPHACEAE:—*Typha angustifolia* L., Bulrush,

SCHEUCHZERIAACEAE:—*Triglochin striata* Ruiz et Pav.; *T. procera* R. Br.

GRAMINEAE:—*Themeda triandra* Forsk., Kangaroo Grass; *Neurachne alopecuroides*, R. Br.; **Paspalum dilatatum* Poir.; *Spinifex hirsutus* Labill., C. Jervis; *Microlaena stipoides* (Labill.) R. Br.; *Amphipogon strictus* R. Br.; *Stipa Muelleri* Tate, in colonies from underground runners under Stringybarks near the edge of a swamp on a creek south of the Second Valley Forest Reserve; *Echinopogon ovatus* (Forst.) Beauv.; *Polygomon monspeliensis* Desf., Beard-grass; *Agrostis avenacea* (Amel.) Pilger, Blown Grass; **Aira caryophyllea* L., Silvery Hair-grass; **Holcus lanatus* L., Yorkshire Fog; *Danthonia* sp.; *Triodia irritans* R. Br., C. Jervis; *Phragmites communis* L., Common Reed; **Briza maxima* L., Large Quaking Grass; *B. minor* L., Lesser Quaking-Grass; **Poa annua* L., Annual Meadow-Grass; *Glyceria fluitans* (L.) R. Br., Manna Grass; **Bromus hordeaceus* L., Soft Brome; **Lolium* sp.; **Lepturus cylindricus* Trin.; *Agropyrum scabrum* (Labill.) Beauv.

CYPERACEAE:—*Cyperus tenellus* L. f.; *C. vaginatus* R. Br.; *Schoenus foliatus* (Hook. f.) S. T. Blake (= *S. axillaris* in Black's Flora); *S. apogon* Roem. et Sch.; *S. nitens* (R. Br.) Poir.; *S. Tepperi* F.v.M.; *S. Carsei* Cheeseman (= *Cladium monocarpum* Black); *Eleocharis acuta* R. Br.; *E. gracilis*, R. Br. (= *E. multicaulis* Sm.); *Scirpus fluitans* L. and var. *terrestris* G. Myen.; *S. cernuus* Vahl.; *S. platycarpus* S. T. Blake; *S. inundatus* (R. Br.) Poir.; *S. nodosus* Rothb.; *Cladium junceum* R. Br.; *C. Mariscus* (L.) Pohl.; *C. articulatum* R. Br.; *C. rubiginosum* (So-

land.) Domin.; *C. tetragonum* (Labill.) J. M. Black; *C. laxum* (Nees.) Benth.; *Gahnia trifida* Labill., Cutting-Grass; *G. lanigera* (R. Br.) Benth., C. Jervis; *G. psittacorum* Labill. (used at one time for thatching); *Lepidosperma exaltatum* R. Br.; *L. gladiatum* Labill., Sword Rush, C. Jervis; *L. laterale* R. Br.; *L. viscidum* R. Br.; *L. semiteres* F.v.M.; *L. carphoides* F.v.M.; *Carex appressa* R. Br.; *C. tereticaulis* F.v.M. (also at Torrens Vale); *C. breviculmis* R. Br.; *C. fascicularis* Brott (= *C. pseudocyperus* L.)

RESTIONACEAE:—*Hypolaena lateriflora* (R. Br.) Benth., in swamps; *H. fastigiata* R. Br.

CENTROLEPIDACEAE:—*Centrolepis strigosa* (R. Br.) Roem. et Schult.; *C. fascicularis* Labill.?

XYRIDACEAE:—*Xyris operculata* Labill.

JUNCACEAE:—**Juncus capitatus* Weig.; *J. bufonius* L., Toad Rush; *J. caespiticius* E. Mey; *J. holoschoenus* R. Br.; *J. pallidus* R. Br., Pale Rush, with rust; *J. pauciflorus*, R. Br.

LILIACEAE:—*Dianella revoluta* R. Br.; *Burchardia umbellata* R. Br.; *Lomandra dura* (F.v.M.) Ewart; *L. caespitosa* (Benth.) Ewart; *L. multiflora* (R. Br.) J. Britten; *L. effusa* (Lindl.) Ewart, C. Jervis; *Thysanotus Patersonii* R. Br.; *Th. dichotomus* (Labill.) R. Br.; *Chamaescilla corymbosa* (R. Br.) F.v.M.; *Tricoryne elatior* R. Br.; *Dichopogon strictus* (R. Br.) J. G. Bak.; *Xanthorrhoea Tateana* F.v.M.

IRIDACEAE:—*Patersonia longiscapa* Sweet; *L. glauca* R.Br.

ORCHIDACEAE:—*Dipodium punctatum* R. Br.; *Thelymitra fuscolutea* R. Br.; *Microtis porrifolia* Spreng.; *Othoceras strictum* R. Br.

CASUARINACEAE:—*Casuarina stricta* Ait., Sheoak; *C. striata* Macklin; *C. Muelleriana* Miq.

PROTEACEAE:—*Isopogon ceratophyllus* R. Br.; *Adenanthos terminalis* R. Br.; *Persoonia juniperina* Labill.; *Hakea vittata* R. Br., C. Jervis; *H. rostrata* F.v.M.; *H. ulicina* R. Br.; *Banksia marginata* Cav., dwarf form; *Grevillea lavandulacea* Schlecht.

To be continued next issue.

The Field Naturalists' Section

EXCURSIONS

Date.	Locality.	Time.	Subject.	Leader.
1942.				
April 27—	Tailern Bend	Motor, 9.0 a.m.	Swamp Life	Mr. B. C. Cotton
May 9—	Museum	Entrance, 2.0 p.m.	Ethnology	Mr. N. B. Tindale
23—	Outer Harbor	Train, 12.55 p.m.	Seaweeds	Miss D. M. Matthews
June 8—	Mannum	Motor, 9.0 a.m.	Physiography	Mr. A. G. Edquist
20—	Botanic Gardens	Entrance, 1.0 p.m.	Shrubs	Mr. H. Greaves
27—	Henley-Glenelg	Tram, 1.4 p.m.	Shells	Rev. H. Gunter
July 4—	Museum	Entrance, 2.0 p.m.	Mineralogy	Mr. H. T. Condon
11—	Semaphore-Grange	Train, 12.55 p.m.	Beach Life	Mr. B. C. Cotton
25—	Field River	Motor, 1.0 p.m.	Geology	Mr. R. Sprigg
Aug. 1—	Kooyonga	Tram, 1.4 p.m.	Birds and Pond Life	Mr. W. G. Buick
15—	Eden	Train, 1.0 p.m.	Orchids	Mr. H. Goldsack
29—	Largs	Train, 12.55 p.m.	Shells	Mr. R. C. Shinkfield

TRAM EXCURSIONS.—Meet in Grenfell Street, by T. & G. Building.

TRAIN EXCURSIONS.—Will members obtain their tickets and meet on the train.

MOTOR EXCURSIONS.—Meet at the Town Hall, Adelaide. Book with the Secretary or the Treasurer.

EVENING MEETINGS

Royal Society Rooms, Kintore Avenue.

1942.		1942.	
Feb. 17—	"Brown Men and Red Sand," Mr. C. P. Mountford	May 19—	"Our Changing Landscape," Mr. F. C. Martin
Mar. 17—	"A Naturalist in Norway," Mr. A. G. Edquist	June 16—	Shell Club Evening: Lecturettes
April 21—	"Parks and Gardens" Mr. B. J. E. Bone	July 21—	Botany Club Evening: Lecturettes
		Aug. 18—	"The Clothing of Animals," Mr. J. E. L. Machell

MALACOLOGICAL SOCIETY: Evening Meetings

Royal Society Rooms, Kintore Avenue.

1942.		1942.	
May 4—	"Mitridae" Mr. B. C. Cotton	July 6—	"Volutes" Mr. B. C. Cotton
18—	"Corals" Miss D. M. Matthews	20—	"Shells: Parasitic and Commensal," Mr. B. C. Cotton
June 1—	"Foraminifera" Mr. W. J. Parr	Aug. 3—	Annual Meeting and Exhibits by Members
15—	"Triphoridae" Mr. F. K. Godfrey	17—	"Correlation of Gastropoda," Mr. B. C. Cotton

THE BOTANY CLUB

Saturday afternoons at the Museum, North Terrace.

1942.		1942.	
"Lichens"	Miss B. S. Barriren	"Fungi"	Prof. J. B. Cleland
"Orchids"	Mr. J. Ferries	"Violets"	Mrs. W. M. Nielsen
"Mosses"	Mr. H. Goldsack		(Annual Meeting)
"Plant Conservation"	Dr. H. C. Trumble		



A man of the Pintubi tribe preparing for a secret ceremony near Mount Liebig in Central Australia. He is decorated with emu down, gummed on with human blood, and has blood-soaked gum twig shavings on his head.

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Variations in Chitons from the Flindersian Region

By B. J. WEEDING.

The Flindersian Region extends from Geraldton in Western Australia to Wilson's Promontory in Victoria and includes the northern and western coasts of Tasmania. The Region washed and influenced by the Great Southern Ocean cold current.

Except for a few extra-limital species, the chitons of this Region form a distinctive group quite different from those of the Peronian Region in the east and the Dampierian Region in the west.

Within the Flindersian Region considerable variation is found in both size and sculpture in many of the species, and attempts have been made to separate these variations according to the political boundaries of the States. A number of specific and subspecific names have been introduced, simply because they have been found in Western Australia, South Australia or Tasmania, as the case may be. Frequently these species have been introduced without adequate description or figure. In most cases these names are useless, as the features upon which they are founded are not constant and geographical boundaries to the variations do not exist.

This applies very definitely to those subspecific names introduced for Western Australian variants, for the variations found in these species are found, not only in W.A., but often in the bays of the Great Australian Bight and often to a still greater degree in Spencer Gulf, South Australia. The marine fauna of the eastern coast of that gulf shows a definite western influence. The result is that the western variations are found in South Australia, where they blend indistinguishably with, what may be called, more typical forms, and consequently they cannot be regarded as having either constant features or geographical boundaries. They are worse than useless, for the multiplication of synonyms not only confuses workers but must be a source of confusion or perplexity to students overseas.

At the eastern boundary of the Flindersian Region, the colder waters of the Tasmanian seas produce specimens, which with few exceptions are larger and more strongly sculptured than those found in the warmer

seas of the South Australian Gulfs. This slight variation in sculpture or size has, in several instances, been regarded as sufficient reason for the introduction of new names. If we compare specimens of *Ischnochiton elongatus* Blainville collected in Gulf St. Vincent with Tasmanian specimens, the latter will be found to be much larger and more strongly sculptured. It grows weaker as we travel westward and finally disappears on reaching Spencer Gulf. This species escaped splitting but *Ischnochiton lineolatus* Blainville from Bass Strait has been sub-specifically named *Ischnochiton iredalei kingensis* Ashby and Hull.

To use another illustration—*Notoplax rubrostrata* Torr is a small and rare shell in South Australia, though it is much more common in Tasmanian waters, and like the other two species mentioned, grows to a much larger size. These Tasmanian shells have been named *Notoplax extra* Iredale & Hull. It seems that *Notoplax rubrostrata* Torr grows larger in Tasmanian waters and when it is fully grown it becomes *Notoplax extra* Iredale & Hull !!

At the western end of the Region slight variations from what may be called typical forms also occur and authors have not been able to resist the temptation to record those variations either as "*occidentalis*" or "*westernensis*," at least half a dozen variants now share these names. One unfortunate species appears to have received both of them! This is *Cryptoplax striata occidentalis* Iredale and Hull and *Cryptoplax striata* var *westernensis* Ashby, both names were given without either adequate description or figure.

Cryptoplax iredalei attenuata Iredale & Hull is a name given to the western shells of *C. iredalei* Ashby, but Ashby's holotype came from Port Lincoln and Iredale's description of "*attenuata*" is a good description of "*iredalei*."

Again to use another illustration, *Anthochiton torrianus klemi* Ashby is plentiful in the western end of the Region but Ashby's holotype came from Corny Point, Spencer Gulf. It has fewer sulci on the pleural area than is found on most specimens of the South Australian "*torrianus*." The same weakening

is found in *Aulacochiton cimolius* Reeve and specimens are found in Western Australia with only a few ridges on the central area; these have been given full specific status and called *Lorica paucipustulosa* Hull.

Some species, on the other hand, are more strongly sculptured in the western specimens. The western specimens of *Ischnochiton* (*Heterozona*) *cariosus* are as a rule much stronger sculptured than the eastern shells and have been called "*occidentalis*." Specimens of *Bassethullia matthewsi* Pilsbry with a few more lines than usual on the median valve have been named "*occidentalis*." Perhaps *Ornithochiton occidentalis* Ashby can be accepted with more reason, for although it is inseparable from eastern forms, there are no South Australian forms with which it can intermingle. The same reason cannot be advanced for attaching the name "*westernensis*" to the large green "*resplendens*," as that form is found throughout the whole Flindersian Region, although they appear to be much more plentiful in the west. *Ischnochiton contractus* Reeve is another species which grows coarser in the west, and the name *Gymnoplax urvillei* Rochbrune 1881 is available for collectors who want to separate them, but there are no constant features to make the separation advisable.

The subspecific name *Ischnochiton virgatus exaggeratus* Iredale & Hull could have been used for a dark coloured variety found in Western Australia and in the bays along the Great Australian Bight, but the authors added to the "dark brown or blackish colour" the words "sometimes creamy white" and that leaves the larger size as the only distinguishing feature. The name therefore appears useless to the collector, who cannot always wait for a specimen to grow up before knowing whether to label it *I. virgatus* or *I. virgatus exaggeratus*.

Workers have jumped to the conclusion that as over a thousand miles separate Albany, Western Australia, from Spencer Gulf, South Australia, the Marine fauna cannot possibly be the same. We could give many other illustrations of the attempts to separate the variations in the species within the Flindersian Region, but enough has been given to show the unsatisfactory nature of what has been accomplished. There is no doubt that other workers in the future will attempt to separate existing species, but the unsuccessful

efforts of past workers show that a more thorough knowledge of the whole Region is essential if such attempts are to be of any value.

The influence of the ocean currents has been emphasised by some workers and just as emphatically denied by others. It is doubtful whether enough is known of the direct or indirect influence of the ocean currents upon particularly in the Flindersian Region the flora and fauna of the Laminarian Zone to allow anyone to make authoritative statements on the subject, but it will be better for future workers to take their possible influence into consideration rather than to accept political divisions as an adequate and safe guide for the introduction of new species and subspecies as has evidently been done in the past.

There is great need of more field work with this group of Mollusca, for our knowledge of the range of many of the rarer species is very limited. Actually only a comparatively small percentage of the species have been traced throughout the Region and their variations noted.

More knowledge of the nature of the weed, rock, temperature of the water, and other physical conditions under which the chitons live is also needed. These conditions will probably be found to be the real cause of the difference in size of the shells and the strength and variations in the sculpture.

It has been pointed out that a warm sub-surface current from the Indian Ocean flows along the track of the Southern Ocean cold current and is about 400 miles wide and 250 fathoms deep. This is said to be on the surface at Cape Leeuwin but 150 fathoms below the surface at Cape Northumberland, so that its influence over littoral life is probably insignificant.

But to what extent species are influenced by special environment or dispersed by these ocean currents to more favourable or less favourable situations as the case may be, can only be guessed at at present, and considerable differences of opinion will always be held by workers until years of patient field work and painstaking investigation have accumulated enough data to enable us to speak with confidence about the cause, nature and extent of the many of the variations found in the chitons of the Flindersian Region.

A Teal with a Broken Humerus

By H. E. DUNSTONE and B. COTTON.

The following account appeared in the "S.A. Ornithologist," 1942, 16 (1), 11. An X-ray of the bone is here reproduced:

In 1929 Mr. Richards noticed at Tantanoola a Grey Teal (*Querquedula gibberifrons*) flying erratically, and shot it. The bird was later dressed and prepared for eating, when it was noticed that the humerus of the left wing was deformed as the result of a bad break and subsequent unusual repair. An X-ray of the broken humerus was taken. The shaft had been broken across at about one-third of the length from one end, and the muscular pull

had separated the broken ends by a distance of 20 mm., and overlapped them by a similar distance. A bony bridge 15 mm. wide and 10 mm. span had been formed to connect the two portions of the broken shaft. The ends of the fractured bone had been rounded off, and played no part in the repair, which had been carried out by the periosteum of the shaft of each fragment for some distance from



of 20 mm., and overlapped them by a similar distance. A bony bridge 15 mm. wide and 10 mm. span had been formed to connect the two portions of the broken shaft. The ends of the fractured bone had been rounded off, and played no part in the repair, which had been carried out by the periosteum of the shaft of each fragment for some distance from

effective. The resulting architecture of the bridge is a good example of how Nature provides structural details to withstand stress where it is most required.

The specimen was donated to the South Australian Museum by Mr. P. K. Bidmeade, who received it from Mr. Richards some years ago.

Some History of Kangaroo Island, South Australia

By GEORGE PATTISON.

To most people of South Australia some knowledge of Kangaroo Island exists, but to the rest of Australians there is almost a total ignorance of its existence. Yet it is Australia's largest island, in its coastal sea belt, also the most interesting. It is situated across the entrance to St. Vincent Gulf of South Australia. In 1802 it was given its name by Capt. Flinders owing to so many kangaroos being there. The island is about 110 miles long by 40 to 50 miles wide for the major part of the length. At the eastern end is a knob of land almost separated from the rest of the island. Only a narrow neck of land about half a mile wide joins the two. At the extreme east end of this knob of the island is one of our first lighthouses, Cape Willoughby.

It was originally named and charted as Sturt Lighthouse. It was from this lighthouse station in 1859-61 that rations were issued to the last survivors of the aboriginal women who had been stolen from the mainland by the early escaped convicts and sealers. The last of these women were named Sally, Betty, Nelly, and Mary Adelaide. The woman Sally was demented, and had to be looked after by the other aborigines. They lived in the bush and along the coast from Hog Bay to Sturt Lighthouse (Cape Willoughby). Their rations consisted of flour, sugar, rice, and blankets. These were issued to them by the lighthouse keeper, W. A. Cawthorne, who was the son of the first lighthouse keeper, Capt.

W. C. Cawthorne. At the end of 1860 another lubra turned up for rations, by name of Mary Manarto. After the end of June, 1861, these natives must have died. They came no more for rations, and all traces of them were lost.

They did not like the flour and rice, but valued the sugar and blankets. Evidently these natives had been discarded as they grew old by the men who stole them from the mainland, or their man had been killed, or died. Fatal brawls were frequent amongst the wild element of the escaped convicts and sealers. Between this "knob" of the island and the mainland is a narrow sea-way of 8 to 12 miles wide, called Backstairs Passage.

Nearly three-quarters of the island's coastline is bold and perpendicular cliffs. Many famous square-rigged sailing ships were wrecked and dashed to pieces on these, at different parts of the coast, generally with a total loss of all hands. So numerous lighthouses and warning unattended lights were built around the most dangerous parts of the coast in the track of shipping routes. Owing to the wrecks of the "Loch Sloy" and the "Loch Vennachar," two fine full-rigged sailing clipper ships of the wool clippers of 1900 period a powerful 750,000 candlepower lighthouse was built on the S.W. point of the island. This point was Cape de Couedie.

Close to here in 1905 the "Loch Vennachar" was wrecked with the loss of all hands. She was driven ashore by northerly gales when trying to make the Backstairs Passage. Another day's fair wind run would have landed her safely into her destination at Port Adelaide. I think only three people got ashore from the wreck of the "Loch Sloy," which also occurred not far from Cape de Couedie. One died from starvation after getting to the cliff top. He was too hurt to walk. The other two survivors set out in different directions through the dense scrub in search for help. One was found by the head keeper of Cape Borda Lighthouse, and the other by an old resident of the island, who was carving out a home for himself in the bushy scrub of the island, at Rocky River. When the help arrived at the cliff top, the scene of the wreck, only the bones of the other survivor were found. He had dragged himself around a bit, and eaten all the "pig's-face" plant he could reach, for food and drink, but it was not enough to sustain life until help came.

The surface of most of the island is covered by a dense scrub. It is far more prickly and thorny than is known on the mainland. Very fertile patches now make good farm and pasture lands, but most of such are on the north side of the island facing the mainland.

Most of the island is still pure virgin land in its natural state. Although the land is poor

in most places, a thick, luxurious growth of trees and shrubs exists, owing to a good rainfall and a mild climate. Some of the largest kangaroos ever known live here. Runaway convicts from Botany Bay and Van Dieman's Land found an arcadian home here when they landed in whale boats which they had stolen.

Also old sealers, either wrecked or runaways, threw in their lot with the escaped convicts. Early in the 19th century, about 1805, some sealers were known to be living on the island.

Uncontrolled by any Government, the inhabitants in the early part of the above century became a "law unto themselves." They raided the mainland across Backstairs Passage, and stole the women from the Australian aborigines and took them back to live with them on the island. Wild characters were amongst some of the escaped convicts, and lawless small mobs arose, so much fighting and wild orgies took place. Seal skins and other products were bartered for intoxicating liquor from whaling and sealing ships which touched at the island. If any punitive expedition was sent against them, the islanders retired to the dense scrub inland, until the soldiers were withdrawn. However, by 1836, when the founding of South Australia took place, the newcomers found the people of Kangaroo Island fairly orderly and a controlled community. Many wild tales are told of happenings before this period. One notorious bully, who held his leadership of the wild gangs by terrorism, was finally got rid of by those under him. They were killing and skinning seals at the bottom of a high cliff, having got down there by means of sliding down a rope. While their bully leader was engaged killing the seals, the others climbed back up the rope, with the intention of leaving him to his death by hauling up the rope. The leader turned and saw them climbing back, so ran and climbed up after them. However, the last man before him reached the top of the cliff with the bully just behind him, then he cut the rope and the leader was dashed to pieces when he fell.

The Yacca Gum tree grows to perfection on the island, and an industry in the gum product of the tree sprang up. Farmers also combine a eucalyptus still with their farm. Some of the finest eucalyptus oil is distilled by them and sent to market. The island should be more accessible to people of the

mainland, as it is an ideal place either for the "camper-out" or the small towns offer splendid accommodation to visitors. The island has a beauty of its own, of virgin country somewhat different to anything on the mainland. Big timber sometimes appears to change suddenly to thick scrub and then to yacca country. It is not many miles to Harriet River and Vivonne Bay from Kingscote.

This is an ideal place to camp: good fishing and shooting. One can fish in the river or from a jetty which was built here years ago. Even township sites and blocks were surveyed here, but about the only cargo ever shipped from the jetty was a few loads of yacca gum into ketches. Good camping is also to be had at Stuns'il Boom River. This name brings back the days of the "wind-jammer" sailing ship to one's memory, with all its romance and hardships. If one goes on a bit farther, Sou'-West River will be reached. Here can be caught plenty of fish, mostly bream. So why not camp here for a few days, eat, drink, and lazily be merry? Close by is the Flinders Chase Reserve for Flora and Fauna, well worth a visit, to Rocky River Station, the headquarters of the caretaker.

At the extreme S.W. corner of the island you come to Cape de Couedie. Here is the grandest and most awe-inspiring cliff coastline in all Australia. There are steps in a cliff-face here, cut into the cliff by some of the very early gangs of convicts who escaped from Van Dieman's Land. This was over 100 years ago, and erosion had worn away some of the steps that were cut in the cliff-face. With a cold-chisel and hammer I recut these steps, with a rope around my waist to support me while doing so. Here is the place where the rope was cut and the bully leader sent to his death.

Back to the other end of the island now. The visitor who has not the exploring strain and love of nature in their psychology can here find a "place of rest and contentment," either at Kingscote or American River, or at Penneshaw. "To go is to go again" would be a slogan worthy of Kangaroo Island.

Very much more could be written of this island, with its history dating back long before the foundation of South Australia, but space does not permit.

The Protoconch or Embryonic Shell of the Gastropod

By BERNARD C. COTTON and FRANK K. GODFREY.

The Gastropod protoconch is the nuclear shell which is completed in the egg during the embryonic stages. It consists of few or several turns or whorls, and not infrequently differs in form from the shell of the adult.

It is always coiled in a spiral, even though the adult is without spiral form, as the limpet.

The larva is characterised by its velum and other external or superficial larval organs. The *velum* (Lat. a covering, curtain) is the locomotory ciliated ring, which arises antero-dorsally and circumscribes the apical area. As in the *Crepidoda*, it is only slightly prominent in the most archaic marine forms, such as the limpets, the *Trochidae*, etc., but in other Gastropods it becomes more and more prominent, and eventually gives rise to a natatory or swimming velum formed of two lateral lobes with ciliated margins. These lobes may in turn be subdivided into two or three secondary lobes, as in *Atilanta*, and in some of the *Strombidae*. In viviparous species, in forms like the *Pulmonata*, in which the young are hatched in the adult condition, the velum is rudimentary or disappears altogether; in the *Basommatophora* (fresh water *Gastropoda*), it is developed to a slight degree, but only on the sides, and is not continuous, as in the *Lymnaeidae*, but in the *Ellobiidae*, *Amphibolidae*, and *Siphonariidae*, all of which are marine, a normal velum is present.

The foot is always present in the newly hatched larva, and is very short at first. The operculum is formed early, and exists in all testaceous larvae, even in cases in which the adult possesses neither shell nor foot; the only exceptions to this statement are the *Pulmonata* (but excluding the marine *Ellobiidae*, *Amphibolidae*, and *Siphonariidae*, which conform), and the *Pteropods*. The pedal glands arise in some species in the larva, though they are absent in the adult, as for example *Neothais*.

The primitive shell-gland appears at the beginning of development in the centro-dorsal area behind the velum. It is surrounded by a ridge which gradually extends over the visceral sac and secretes the shell. The young shell grows in thickness internally, fresh matter being added to it from the external surface of the mantle of the animal, but its increase in extent is dependent on the activity of the border of the mantle, where there are special glands which degenerate when the animal reaches the adult state. It is only at this period that the aperture of the shell acquires a lip, or is contracted in various ways to form, for example, the linear aperture of the Cowry, Olive, etc.

Post-larval metamorphoses occur in various cases. The velum disappears, then in various genera the operculum falls off, and so also does the shell in naked forms, as the *Nudi-branchs*.

It is only in rare cases that a second larval form exists after the disappearance of the velum, and before the adult stage is reached; this is the case, however, in certain of the *Pteropoda*, in which three transverse and parallel ciliated rings are formed before the fins are completely developed.

It is only in exceptional cases that the young are hatched out with the characters of the adult, but this is the case in all the land and fresh water species of the *Pulmonata*, in certain genera of *Opisthobranchia*, and in the *Littorinidae*, also the *Thaididae* and *Buccinidae*. In normal cases the young Gastropods are hatched out as free-swimming or pelagic veliger larvae. This *veliger* (*velum*, and *gero* to carry) has a more or less voluminous velum, and is the characteristic larval form in most of the *Gastropoda*. Even in those that are hatched out in the adult form, the veliger stage can generally be recognised, in a more or less reduced condition, within the egg membranes.

Generally the velum is reduced in proportion as the foot develops; nevertheless, in a con-

siderable number of pelagic larvae the veliger stage is preserved for a long time, and the velum persists, and often develops excessively long lobes, even after the creeping foot is fully and normally developed. The velar lobes may even produce lobate expansions of the margin of the aperture of the shell, although these disappear when the velum is eventually absorbed and the shell assumes the adult form. Such juvenile forms were accepted by the early authors as distinct, and several genera were set up for their reception.

Sinusigera d'Orbigny 1846 was a genus thus proposed with the following description—"Turbinate, imperforate, dextral or sinistral, with a smooth, striate or tuberculate surface and frequently a keeled periphery; aperture channelled in front, peristome thickened, reflected, with one or two claw-like lobes. The animal has four arms, arranged in cruciform manner and used for swimming. There are two tentacles, and the eyes, well formed, are situated on the outer side of their bases. Siphon short, being a simple fold of the mantle. Foot large, very mobile, with a small, thin, spiral operculum."

Conchologists were so impressed by these discoveries that some proposed to group such molluscan forms in an order by themselves, while others placed them among the *Pteropoda*. Late last century their true nature was recognised and the idea of separate genera was dropped. The name *Sinusigera* (Lat. *sinus* a curve or bay, *gero* to carry) has been retained as explanatory of that form of the Gastropod protoconch, with one or more claw-like processes on the labrum or outer lip, and a relatively broad and deep curve or bay on either side. It is free-swimming, and has the ability to remain afloat for considerable periods, although direction is controlled by the ocean currents. Should the juvenile thus impelled arrive at a suitable habitat within a certain limited time, it will settle and develop there. If no such coast, or rock, or island is met with, the animal dies. The numbers lost in the open sea must be prodigious, the tiny shells contributing to make up the ooze on the ocean floor. Common southern Australian examples of the group are the *Triphorids*.

To know whether a shell possesses a *Sinusi-*

gera apex, very young shells must be collected either alive or dead. Many species have such apices, but in adult specimens the characters are so obscure that it cannot be recognised. Moreover, it is very often tilted, and the later, true shell whorls overrun the claw and make it unrecognisable. A shell with a *Sinusigera* apex may be expected to be of widespread distribution, and, vice versa, many species, widely distributed, most certainly owe their range to their *Sinusigera* youth. An examination of the marine molluscan fauna of almost any Pacific island will demonstrate this, when the majority of the Gastropod species are recognisable as possessing free-swimming *Sinusigera* larvae.

The occurrence of the *Sinusigera* apex has been noted in families, *Mitridae*, *Buccinidae*, *Thaididae*, *Pyrenidae*, *Coralliophilidae*, *Turritidae* (in genera *Turris*, *Drillia*, *Daphnella*), *Terebridae*, *Triphoridae*, and *Cerithiidae*.

A *Triphora* species has been taken in the open sea, with eight or nine whorls, free-swimming, the animal still having larval characters. One could reasonably doubt the possibility at such an occurrence in connection with our *Neothais textilosa* although credited with *Sinusigera* properties. The *Triphorid Sinusigeras* are much different in shape and form from those of the *Thaididae*. They are much more minute and elongate, and the claw is in reality the only resemblance. The apices of some species of *Strombus* indicate their free-swimming properties, though of quite a peculiar nature. It is probable that the *Cypraeidae*, in which many species are so widely distributed, has a *Sinusigera* youth, but the post-embryonic whorls clasp the embryo so high up that the absence or presence of a claw cannot be even guessed at. *Conus* stands unrevealed without any clue as to the nature of its apex. *Ianthina* is also a doubtful group.

There are Gastropods which, though having a wide range, apparently give no clue to their means of distribution.

Agadina is a genus name proposed by Gould in 1852, with description—"Shell colourless, pellucid, planorbular, one side showing five or six whorls, the other a single volution with a large umbilical pit; aperture oblique, campanulate, and projecting beyond the last whorl like a hood. The single species

(*cucullata* Gould) was found floating near an iceberg in 60 degrees S. latitude and 106 degrees E. longitude. The animal is black, with oval appendages, not lobed." Iredale refers to it as "that peculiar pseudo-sinistral mollusc which we know to travel by means of free-swimming larvae of a kind totally at variance with the preceding [*Sinusigera*]." He sought a solution and came upon an "Agadina" commencing a post-embryonic whorl, which indicated that it was going to be imperforate of a peculiar kind. Research revealed this imperforate "Agadina" to be *Bullina scabra* Gmelin. *Bullaria* was then found to possess this Agadina protoconch, and *Umbraculum* also apparently has it.

In recent years scarcely any scientific worker has described a new minute shell without carefully detailing the apical characters and using them for classificatory purposes. Grabau 1902, remarked "I believe it is not too much to say that the protoconchs of all the species within a given genus should agree as to their essential characteristics, and that no species can be considered congeneric in which the protoconch shows a radical difference. The smaller the classified group the more nearly identical must be the earlier stages, since in a small group the members have not become widely separated from their common ancestor."

Many species of the *Volutidae* have a protoconch which was at first horny. Here the larva is clothed with a cuticular or horny protoconch; later on, but while still in the egg-capsule, the deposition of limy matter begins as a slender cone or elevated point along the axis of the protoconch, and as the larva grows the posterior part of the mantle secretes a shelly dome. The horny protoconch, being thus cut off, disintegrates, and the apex of the shell presents a slightly irregular dome, with a slender point rising from the apical part—the "caricelloid" protoconch. *Cymbiola kreuslerae* Angas has it, and it is well seen in Pliocene genera. Certain others of the *Volutidae* have the "scaphelloid" protoconch, which is a somewhat similar, slightly irregular dome but without the slender point or sharp spike, as *Ericusa fulgetrum* Sowerby, and *Melo miltonis* Gray.

A third group—the "cymboid" protoconch of large size—is also apparently secondary to

a horny protoconch, and is illustrated by *Livonia roadnightae* McCoy, and *Cottonia dannevigii* Verco.

This calcareous cast of a primitive horny shell has been designated the pseudoprotoconch, in contradistinction to the true protoconch which was secreted previous to the veliger. Many true protoconchs are, however, calcareous, as for example *Amorena undulata* Lamarck, and all the species of families *Triphoridae*, *Trochidae*, etc.

From our observations it appears that with certain species of the *Volutidae*, the formation of early adult structure takes place within the egg-capsule.

The capsule mass of *Melo miltonis* Gray, is cylindrical. An example in the South Australian Museum measures 165 mm. in length, 75 mm. in diameter, and was apparently attached by one end. It contains forty-seven individuals, all with their apices turned outward and their anterior canals towards the centre. Specimens, which entirely fill their respective capsules, consist of a protoconch of three and one-half whorls, uniformly cream coloured, axially wrinkled, and finely obsoletely spirally ribbed subnatally—and a half whorl of adult structure, with the typical triangular white blotches on a light brown ground. These average 26 mm. in height, and 16.5 mm. in greatest diameter.

The crown of the spire is flatly rounded, the nucleus being slightly depressed. The protoconch is but faintly defined from the succeeding structure by a slight and somewhat abrupt thickening of the shell. It is probable that this protoconch was cast inside a horny individual, which was discarded at an earlier stage.

The columellar plaits of *Melo miltonis* all arise in the protoconch. The first to appear is the anterior, and the last the posterior, this last being subsequently aborted. The anterior, which in this species is merely an emphasis of the columellar edge, appears on the protoconch (pseudoprotoconch?) when only two whorls have been formed; the third follows so soon after the second that they may be said to arise simultaneously, on the completion of two and one-half whorls; the fourth arises a quarter of a whorl later. The last gradually degenerates after the formation of about five whorls, and has sometimes dis-

appeared by the time six and one-half whorls are completed.

The nepionic stage or infancy of the Gastropod mollusc is that stage during which the larval organs become aborted. It is a very transitory one, and leaves, in most cases, no conchylaceous (shelly) record.

There are three types of transition from embryonic to adult shell structure, viz:—

1. Those in which the embryonic shell is faintly, if at all, defined from subsequent structure, as *Melo miltonis*, and the species of family *Triphoridae*.

2. Those in which there is an abrupt change from embryonic to subsequent structure, as *Mayena australasia* Perry, *Cymatiella verrucosa* Reeve, *Colus australis* Quoy.

3. Those in which a varix is thrown up at the conclusion of the protoconch before adult structure is initiated, as *Pterynotus triformis* Reeve.

Now the primitive shell-gland is distinct from the area which secretes the shell of the adult. In the first type therefore, it seems probable that, parallel with the gradual cessation of functional activity on the part of the primitive shell-gland, there was a gradual assumption of secretive activity on the part of the epithelial cells of the mantle and visceral hump. In *Melo* the acceleration of development which the formation of adult structure within the egg-capsule presents, points to a correspondingly transitory nepionic stage, consequently there is only a slight defining line. It is evident from its weight and size, as described above, that the veliger stage of *Melo miltonis* is passed within the egg. In the *Triphoridae*, on the other hand, there is an extreme protraction of the veliger stage: an example, as recorded above, has been taken in mid-ocean with several adult whorls already formed. In this family the true embryonic shell or protoconch is calcareous. The explanation given above still applies, but in this instance the transference of functional activity from the primary to the secondary shell-secreting area, took place some time prior to the nepionic stage. The protracted retention of the velum here allows a much greater development of the other organs, so that the mantle edge assumes its adult form and secretes shell-structure which, although genetically embryonic, is morphologically adult. The other organs being well advanced

in development, the nepionic stage is concerned only with the degeneration of the velum, in these instances also it will be very brief. From this it may be reasonably expected that this type of transition will prove to be correlated with an extremely condensed nepionic stage.

The second type of transition is illustrated by *Mayena australasia* Perry. Here the true protoconch is horny and contains practically no calcareous matter. During the formation of at least part of this, the organism is a free-swimming veliger. In due course rather less than half a whorl of adult structure will have been added. The protoconch has now deposited within it distinct traces of the pseudo-protoconch in the form of an extremely thin layer of calcareous lining; also the adult structure is much thicker. The mollusc itself will have become sedentary, having lost all traces of the velum. The abrupt transition from one structure to the other may be explained by the sudden functional activity of the secondary shell-secreting area. It is probable that during the nepionic stage, which was slightly protracted, there was a complete cessation of shell growth, and that the primitive gland had ceased its function before the adult shell was initiated.

The third type of transition is illustrated by *Pterynotus triformis* Reeve, and *Torvamurex denudatus* Perry. A stout calcareous protoconch, longitudinally sculptured, is followed by a prominent varix. The sculpture of the protoconch is such as to prove conclusively that it was not cast inside a horny mould and is therefore a true protoconch. The embryo thus had the ability to secrete a calcareous shell. It seems reasonable to suppose that during the nepionic stage (during which there must generally be a longer or shorter pause in the growth of the mollusc) the secretion of shell was carried on by the free edge of the mantle. The varix, therefore, may be looked upon as the shelly record of the nepionic stage.

There are different types of protoconch. The four general types here set out will cover most of the field.

Cominella-type. Paucispiral, of one-and-a-half to two whorls, rounded and globose, generally quite small but occasionally large, everywhere smooth and polished, generally marked off from adult whorls by a distinct

varix, but otherwise not differing anywhere in texture or material from the normal shell, the initial whorl rather bulbous and asymmetrically placed; nowhere horny. This is the simplest type of apex, and is seen in *Colus*, *Cominella*, etc., and, in a modified taller form, in many genera of the *Pyrenidae* and *Cancellariidae*. *Hypocassis bicarinata* seems to be a form of this type, in which the initial whorl of the protoconch is of irregular growth, being turned almost at right angles to the plane of the next, the nucleus immersed; it contrasts with the tropical *Cassis cornuta*, which bears a large wide polygyrate horn-covered embryo, a form of *Neothais*-type.

Amorena-type. Turbinate, of about four whorls, globose, rapidly increasing, usually wider than high, the tip minute and planorbid; set almost symmetrically on shell, polished, white, and shining, with no trace of a horny envelope, differentiated from normal shell only by inception of adult sculpture. Examples are—*Cymatona kampyla* Watson, *Cymatiella verrucosa* Reeve, and *Amorena undulata* Lamarck.

Lyria-type. Paucispiral, of about two whorls, the last normal and much as in *Amorena*-type, but the initial whorl quite irregular in shape, roughened, and markedly differentiated in texture from the polished succeeding whorl, beginning in a lateral blob or point which may be quite erect and sharp; the whole appearance is that of a scar left by the loss of some integral part. Examples are—*Ericusa fulgetrum* Sowerby, *Cymbiola exoptanda* Sowerby, and *Lyria mitraeformis* Lamarck. The scar seems to denote the loss of a previous entirely horny part, which did not envelope the whole embryo, calcification proceeding before this was completed. The chitin is easily and early lost. This type of protoconch is very widely spread and appears to have no climatic limitations.

Neothais-type. Tall, narrowly conical, pointed, of about four whorls, set slightly oblique to the axis of the shell, entirely coated with a persistent brown horny envelope, strikingly differentiated in colour from the rest of the shell. South Australian examples are *Neothais textiliosa* Lamarck, and *Ianthina violacea* Bolten. It is practically confined to tropical and sub-tropical seas, where it is

common, and almost certainly, represents a *Sinusigera*, free-swimming embryo. The chitin is persistent.

In conjunction with the nervous system, radula, operculum, and shell formation, the apical features are a definite aid to classification. It would be absurd to say that all species which agreed in type of apex were congeneric, but it certainly seems that species which do not agree in type of apex cannot be congeneric.

Evolution must proceed in the apex as well as in the shell, and it has been suggested that the course normally followed is from—Paucispiral calcareous, *Cominella*-type; polygyrate calcareous, *Amorena*-type; paucispiral, part calcareous and part horny, *Lyria*-type; to polygyrate horny, *Neothais*-type.

The horny parts may and mostly do have a limy stratum underneath, but this when exposed lacks the regularity and polish of the normal shelly and horny surfaces.

FUNDS FOR RESEARCH.

The late Mr. W. Burdett, before his death, appointed Sir Douglas Mawson and Professor J. B. Cleland as Trustees to hold in trust a fund of one hundred pounds (£100) from which the Trustees may pay all or part to any person or persons who may discover in South Australia fossil remains of rare or unknown marsupials, reptiles, or birds in Pleistocene, Pliocene, Miocene, or earlier geological deposits on condition that the specimen or specimens are presented to the South Australian Museum.

If one of the aforesaid trustees shall decline to act or shall die, the remaining trustee shall have the power to nominate a trustee to fill the vacancy provided such nomination is approved by the Director of the South Australian Museum.

Mr. H. J. Tyackbake has generously placed at the disposal of Professor Cleland £10/10/- "to help in a small way some branch of pure science . . . naturally I think of Natural History and Botany, but I am no narrow specialist." The money is held by the University of Adelaide.

The Platypus in South Australia

By H. M. HALE and J. D. SOMERVILLE.

Professor F. Wood Jones, whilst noting that many writers had recognised six species in the genus *Ornithorhynchus*, placed this unique Australian animal under one scientific name, *Ornithorhynchus anatinus* (Shaw, 1799).⁵

Tom Iredale and E. LeG. Troughton in the Memoir VI of the Australian Museum, Sydney (1934), adopted four geographical races:—*Ornithorhynchus anatinus anatinus*, *triton*, *phoxinus*, and *crispus*.¹⁰ Troughton in his "Furred Animals of Australia" (1941), following Oldfield Thomas (1923) as to the first three and suggested the use of a race name for the Tasmanian form, uses the same geographical races as in the Memoir, giving the reasons for retaining such names and *inter alia* said "the platypus, however named, is just as interesting. To the reader these various races are mainly of interest in emphasising the extensive eastern range of these fascinating creatures."¹⁸ He gives the habitat of the four races as:—Coastal area from north of Sydney, southward through Victoria; upper waters of the Darling and Murray; Nth. Queensland; and Tasmania respectively.¹⁸ The western limit is placed as the 138th Meridian¹⁹ but Troughton makes no provision for a race name for the South Australian form. The recent River Murray specimen comes under *O. a. triton* (Thomas 1923).¹⁷ It is understood that when the article on the platypus was written for the "South Australian Naturalist"¹¹ no other record of its existence could be traced, however it is interesting to notice that in a discussion prior to the publication, Mr. N. B. Tindale, B.Sc., told one of us that the natives on one part of the Murray were able to describe the platypus and said there was an aboriginal name for it. At that particular time, H. M. Hale was absent overseas. On his return, hearing of the 1939-40 River Murray record, he instituted an extensive search, and many old records were discovered. It seems most desirable to tabulate these for general information, pending the publication by Mr. N. H. Finlayson of a monograph he proposes to write on the platypus, when the list may be considerably expanded.

No published substantiation of its past or present occurrence in South Australia is given

by Waite (late Museum Director) or Wood Jones (one-time Professor Adelaide University).

RECORDS.

1. Capt. (after Sir) George Grey, who was Governor of South Australia 1841-45, sent a specimen to the British Museum (2, 16, 17.)
2. Lower Murray according to Krefft. (2, 19.)
3. River Torrens, numerous in, in the early days according to A. Molineaux on the authority of A. Zietz. (15, 16, 17.)
4. Onkaparinga River, Robert Davenport, 1867. (8, 15, 16, 17, 18.)
5. Onkaparinga River near Hahndorf, 1873, quoted by the Misses Hill. (1, 11, 17.)
6. River Murray, Overland Corner, early 1890-ies, article by Miss A. E. Harwood, probably from information of Mrs. Miller, Wudinna, West Coast. (14.)
7. Torrens Lake, Adelaide, on the River Torrens, W. Forester found a dead one, say 1892 or 3. (3, 17.)
8. River Murray, near Murray Bridge, 1894, found by B. J. Jarman. (8, 12, 13, 16, 17, 18.)
9. River Murray, near Tailem Bend, no particulars. (7, 8, 9, 17, 18?)
10. Skin of one from near Strathalbyn sold at auction say prior to 1895 to 1900, that is more than 40 to 45 years "ago" in 1940. (15, 16, 17.)
11. River Murray, where it enters Lake Alexandrina about four miles below Wellington, 1904. Caught by J. Braunsthal and forwarded to Adelaide by Mounted Constable F. Gardner. (12, 13, 15, 16, 17.)
12. Deception Creek, near Copley, rock carving which Dr. Basedow interprets as strongly suggestive of a platypus. Basedow also states, natives and bushmen describe an animal at Dalhousie Springs which may refer to the platypus. (4, 16, 17.)
13. In the interior recently (i.e., before 1925) seen by an informant of Hale and Tindale. (6, 17.)
14. Glenelg River in the South-East, no particulars. (8, 16, 17, 18.)

15. Finnis River, near Myponga; Mount Compass; and Nairne. Ron Minchin received reports that the platypus was seen near each of these places. (17.)
16. Back Valley branch of the River Inman, seen by Mr. J. W. Crompton over a series of years up to 1938. (17.)
17. River Murray, location not divulged, found by a fisherman, 1939. (12, 13, 16, 17.)
18. "Six pairs of platypuses are being brought to Adelaide from Victoria," 1940. (16.)
19. In Party Paper 71 of 1929 Fauna & Flora Board Report 1928-29, when 2 male and 1 female specimens were received from Tasmania.
20. In Fauna and Flora Board Report for 1941, where it is stated that on February 19, 1941, 5 pairs were received from Victoria.

Notes:—Nos. 4 and 5 may possibly be the same record, although the years are so divergent. The Misses Hill went to the Lakes with a party of which Mr. (later Sir) Samuel Davenport, a brother of Robert Davenport, was a member.

Nos. 6, 9, 12, 13, 15 may be regarded as doubtful records.

REFERENCES.

1. What We Saw in Australia, by Rosamond and Florence Hill, 1875, p. 57.
2. Brit. Mus. Cat. of Marsupialia and Monotremata, 1888, O. Thomas, p. 387 et. seq.
3. The Province of South Australia, by J. D. Woods, 1875, p. 57.
4. Journal of the Royal Anthropol. Institute XLIV, 1915, pp. 202 and 205 and F.N. 2, pl. V.B, fig. 4., Dr. H. Basedow.
5. Mammals of South Australia, Prof. F. Wood Jones, part I, 1923, pp. 46-55.
6. Rec. S. Aust. Mus. III, 1925, p. 56, Hale and Tindale.
7. Rec. S. Aust. Mus. III, 1925, p. 17, Edgar R. Waite.
8. The Platypus, Harry Burrell, 1927, p. 141.
9. Reptiles of South Australia, Edgar R. Waite, 1929, p. 41.
10. The Australian Museum, Sydney, Memoir VI, 4/5/1934, Tom Iredale and E. Le G. Troughton, pp. 1 and 2.
11. The South Australian Naturalist, Dec. 30, 1939, Vol. 20, part 1, p. 16.
12. The Advertiser, South Australia, 7/3/1940, p. 16, col. 8.
13. The Advertiser, South Australia, 8/3/1940, p. 25, cols. 1 and 2.
14. The Advertiser, South Australia, 12/3/1940, p. 17, col. 1.
15. The Advertiser, South Australia, 13/3/1940, p. 21, cols. 1 and 2.
16. The News, South Australia, 16/4/1940, p. 4, col. 8.
17. Confirmation of the Occurrence of the Platypus in South Australia. Draft article by H. M. Hale in 1940 now enclosed in Museum Department Docket 32/1942.
18. Furred animals of Australia, Ellis Troughton, 1941, pp. 1-8, pl. 1.
19. Cat. Mamm. Aust. Mus., Krefft, p. 56 (1864), id. Vert. Lower Murray (1865), p. 22 (see p. 389 in No. 2 above).

The Public Library of South Australia

By H. C. BRIDESON

(Library Research Officer, Public Library of S.A.)

The Public Library on North Terrace houses a wealth of information for the naturalist, the extent of which probably is not fully realised. The collection of books on Natural History is a large one; in addition the Library files many periodicals of absorbing interest to nature lovers.

The Library's history has been long and eventful. The object of this paper is to

trace briefly the growth of the institution from its very humble beginnings to its present position.

History.

The colony of South Australia was established in London in August 1834, and in the same month in that city a group of gentlemen founded "The South Australian Literary and

Scientific Association" for the purpose of "the cultivation and diffusion of useful knowledge throughout the colony." From this beginning has grown the Public Library of South Australia.

The first collection of books, 117 in number, were sent to the Colony in the "Tam O' Shanter," which sailed from Plymouth on the 20th of July, 1836, three days before the departure of H.M.S. "Buffalo" with Governor John Hindmarsh aboard.

Shortly after arriving in the colony the books were housed in a wooden shanty (shown in the wood cut at No. 19) near the present site of the Adelaide Railway Station; the name was now changed to "The Mechanics' Institute." It is interesting to note that even in this small collection, a number of books were included which were of value to naturalists.

The early history of the Library was one of constantly recurring difficulties, not least of which was finance. It suffered several changes of name, and a number of other collections were at various times incorporated with it.

Due mainly to the efforts of Mr. John Howard Clark a Bill was passed by the Legislature in 1856 for the establishment of a National Institute. "The South Australian Institute" was the title adopted, and the Library was now placed on a sound footing.

In 1859 the Adelaide Philosophical Society was incorporated with the Institute, and this association lasted until 1884, when the Public Library, Museum, and Art Gallery were placed under one board of governors.

From the very modest beginning of 117 volumes the collection has grown steadily until to-day it numbers 222,167.

Public Library Extensions.

During the last 25 years the Library has made considerable expansion, necessitating the formation of special departments.

In 1915 a Children's Library was established. This section now contains 8,619 volumes, and is open on public school holidays, and Saturday and Sunday afternoons.

Five years later the Archives Department was opened.

The Country Lending Service was initiated in 1938. This service has proved a boon to people outside the city, and its growth has been most encouraging. The collection, numbering 8,980 volumes, contains many recent publications on Natural History.

Early this year the Libraries Board instituted the Research Service. The formation of this Department had long been contemplated, but lack of funds had prevented its formation.

The war, however, with its accompanying industrialisation of the State, was occasioning such a great demand for scientific and technical literature that the Board felt that the institution of this department of the Library could be no longer delayed, and special financial assistance was received from the Government. The work of the service may be outlined briefly as follows:—Bibliographies on any technical or scientific subject are prepared, covering the periodical literature available in the various libraries of Australia; photostat or microfilm copies of articles available only in libraries outside South Australia are obtained on request; firms, or scientific and technical men can be kept posted with supplementary lists of current articles dealing with the subject in which they are working.

This service thus makes available to scientists and technicians practically the whole of the technical and scientific periodical literature of Australia. It is helping these men to solve problems and to keep in touch with latest developments in their particular subject.

Bibliography.

South Australian Institute: addresses delivered at the laying of the foundation stone, 1879.

Langham, W. H.—In the beginning. (In *Desiderata*, August, 1936, pp. 5-11.)

Purnell, H. R.—Library development in South Australia. (In *Aust. Institute of Librarians—Second Annual Conference Proceedings*, 1939, pp. 53-56.)

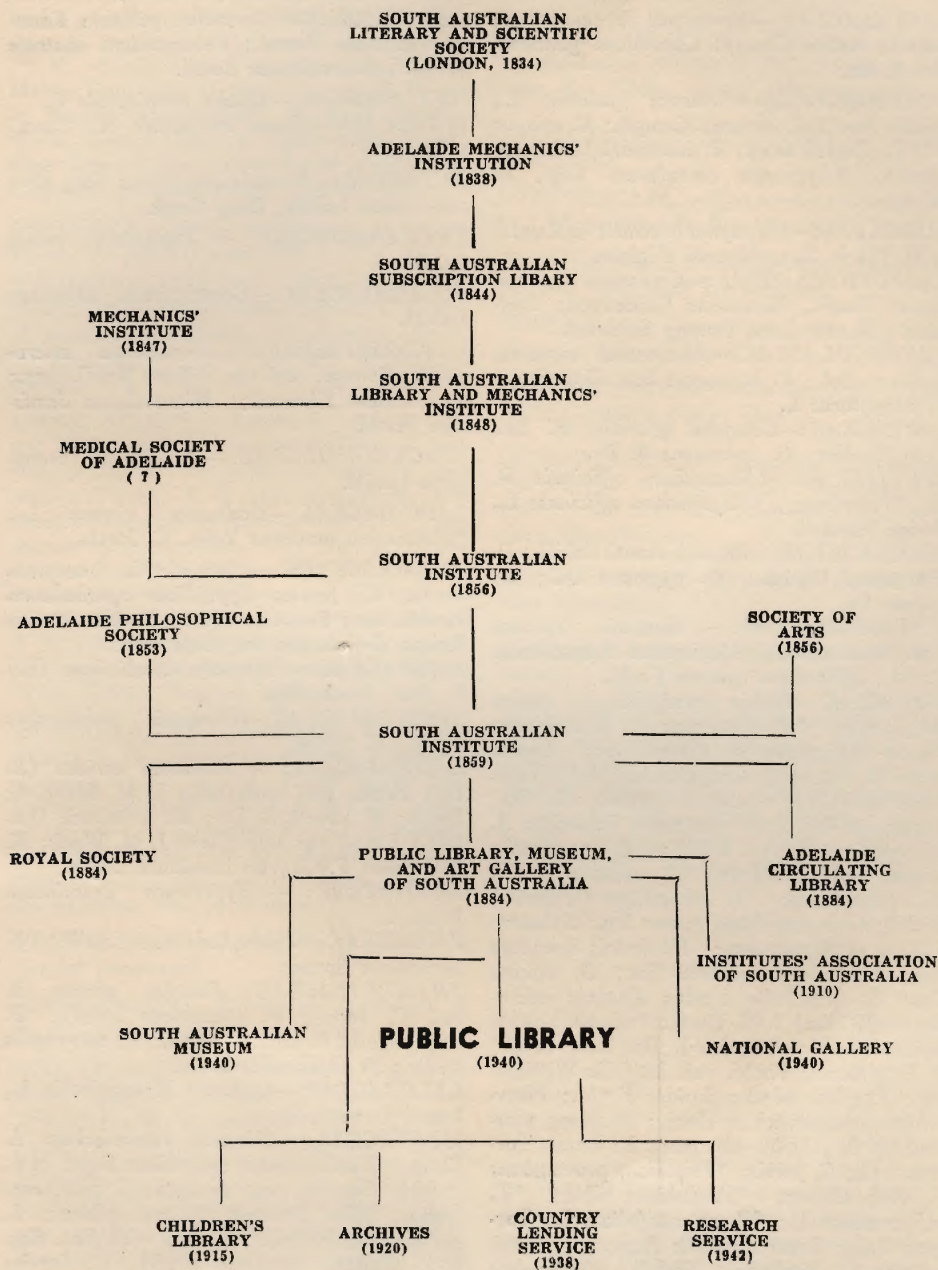
Public Library, Museum and Art Gallery of S.A.—Annual Reports.



North Terrace, Looking East C. 1842

(Engraving by J. C. Halles from a sketch by J. Hitchen)

1, Theatre; 2, Sydney Hotel; 3, Morphet's Residence; 4, Morphet Street; 5, Trinity Church; 6, Rectory; 7, Bank of South Australia; 8, King William Street; 9, Post Office; 10, South Australian Company's Office; 13, Clarendon House; 17, Congregational Church; 18, Police Station; 19, S.A. School Society's Building, in which the Mechanics' Institute was housed; 20, Government House.



Plants Of Fleurieu Peninsula (cont.)

SANTALACEAE:—*Exocarpus cupressiformis* Labill., Native Cherry; *Choretrum glomeratum* R. Br.

POLYGONACEAE:—**Rumex pulcher* L., Fiddle Dock; *R. Brownii* Campd.; *R. crispus* (?) L., Curled Dock; *R. acetosella* L., Sheepsorrell; *Polygonum serrulatum* Lag., in swamps.

AIZOACEAE:—*Disphyma australis* (Soland.) J. M. Black, Round-leaved Pigface.

CARYOPHYLLACEAE:—*Cerastium glomeratum* Thuill., Mouse-ear Chickweed; *Stellaria palustris* Ritz., Swamp Starwort.

RANUNCULACEAE:—*Ranunculus rivularis* Banks et Sol.; *R. lappaceus* Sm., Buttercup; *R. parviflorus* L.

LAURACEAE:—*Cassytha glabella* R. Br., False Dodder; *C. pubescens* R. Br.

CRUCIFERAE:—**Nasturtium officinale* R. Br., Watercress; **Sisymbrium officinale* L., Hedge Mustard.

DROSERACEAE:—*drosera binata* Labill.; *D. Whittakeri* Planch.; *D. pygmaea* DC.; *D. petata* Sm.

PITTOSPORACEAE:—*Bursaria spinosa* Cav., Native Box; *Marianthus bignoniaceus* F.v.M.; *Billardiera cymosa* F.v.M.

ROSACEAE:—*Rubus parvifolius* L., Native Raspberry; **R. fruticosus* L., Blackberry; **Rosa rubiginosa* L., Sweetbriar; *Acaena ovina* A. Cunn.; *A. Sanguisorbae* (L.f.) Vahl.

LEGUMINOSAE:—*Acacia armata* R. Br., Kangaroo Thorn; *A. rhadinodes* Schlecht.; *A. myrtifolia* (Sm.) Willd.; *A. pycnantha* Benth., Golden Wattle; *A. melanoxylon* R. Br., Blackwood; *A. verticillata* (L'Herit.) Willd.; *Gompholobium minus* Sm.; *Sphaerolobium vimineum* Sm.; *Viminaria denudata* Sm.; *Daviesia corymbosa* Sm.; *D. ulicina* Sm.; *D. brevifolia* Lindl.; *Eutaxia microphylla* (R. Br.) J. M. Black; *Pultenaea daphnoides* Wendl.; *P. scabra* R. Br., Deep Creek; *P. largiflorens* F.v.M. var. *latifolia* Williamson; *Phyllota pleurandroides* F.v.M.; *Platyllobium obtusangulum* Hook.; *Bossiaea prostrata* R. Br.; **Ulex europaeus* L., Furze, Torrens Vale, C. Jervis; **Trifolium procumbens* L., Hop Clover; **T. dubium* Sibth; **T. subterranean* L.; **T. angustifolium* L., Torrens Vale; *Lotus australis* Andr.; *L. corniculatus* L., Bird's-foot Trefoil; *Indigofera australis* Willd.; *Kennedyia prostrata* R. Br., Scarlet Runner.

GERANIACEAE:—*Geranium pilosum* Forst. var. *australe* Ostenf.; *Pelargonium australe* Willd. var. *erodioides* Benth.

OXALIDACEAE:—*Oxalis corniculata* L.

LINACEAE:—*Linum marginale* A. Cunn., with rust.

RUTACEAE:—*Boronia parviflora* Sm.; *Correa reflexa* Labill., Deep Creek.

TREMANDRACEAE:—*Tetratheca pilosa* Labill.

POLYGALACEAE:—*Comesperma calymega* Labill.

EUPHORBIACEAE:—*Poranthera microphylla* Brongn. and var. *diffusa* Muell. Arg.; *P. ericoides* Klotzsch; *Micranthemum demissum* F.v.M.

STACKHOUSIACEAE:—*Stackhousia monogyna* Labill.

SAPINDACEAE:—*Dodonaea viscosa* L.; **Melanthus comosus* Vahl., C. Jervis.

RHAMNACEAE:—*Pomaderris racemosa* Hook., C. Jervis; *Spyridium spathulatum* F.v.M., near Porpoise Head; *S. thymifolium* Reiss.; *Cryptandra hispidula* Reiss.

MALVACEAE:—**Modiola caroliniana* (L.) G. Don., Yankalilla.

STERCULIACEAE:—*Thomasia petalocalyx* F.v.M., C. Jervis.

DILLENIACEAE:—*Hibbertia sericea* (R. Br.) Benth. var. *scabrifolia* J. M. Black, C. Jervis; *H. stricta* R. Br.; *H. acicularis* (Labill.) F.v.M. var. *sessiliflora* J. M. Black; *H. Billardieri* F.v.M., on ironstone ridges.

GUTTIFERAE:—*Hypericum gramineum* Forst. f.

VIOLACEAE:—*Viola hederacea* Labill.; *V. Sieberiana* Spreng.

THYMELAEACEAE:—*Pimelea glauca* R. Br., C. Jervis; *P. spathulata* Labill.; *P. serpyllifolia* R. Br., C. Jervis; *P. octophylla* R. Br.; *P. phyllicoides* Meisn.

LYTHRACEAE:—*Lythrum Hyssopifolia* L., Lesser Loosestripe.

MYRTACEAE:—*Baeckea ramosissima* A. Cunn.; *Leptospermum scoparium* Forst. et f., Prickly Tea-tree, near swamps; *L. pubescens* Lamk., Silky Tea-tree, in wet places; *L. myrsinoides* Schlecht., in sand with *Euc. Baxteri*; *Kunzea pomifera* F.v.M., C. Jervis; *Melaleuca decussata* R. Br.; *M. pubescens* Schau., Black Tea-tree, C. Jervis; *Eucalyptus*

obliqua L'Herit., Stringy-bark; *E. Baxteri* (Benth.) Maiden et Blakeley, Brown Stringy-bark; *E. odorata* Behr et Schlecht., Peppermint, C. Jervis, near the sea; *E. cosmophylla* F.v.M., Scrub Gum; *E. viminalis* Labill., Manna Gum, near C. Jervis; *E. rubida* Deane et Maiden, Candlebark; *E. ovata* Labill., White Swamp Gum; *E. leucoxyton* F.v.M., Blue Gum; *E. fasciculosa* F.v.M., Pink Gum; *Calythrix tetragona* Labill., Second Valley.

OENOTHERACEAE:—*Epilobium glabellum* Forst.; *E. pallidiflorum* Sol.

HALORRHAGIDACEAE:—*Halorrhagis teucriodes* DC.; *H. micrantha* (Thunb.) R. Br.; *H. heterophylla* Brongn.; *H. Brownii* (Hook. f.) Schindler; *Myriophyllum amphibium* Labill.

UMBELLIFERAE:—*Xanthosia pusilla* Bunge; *Hydrocotyle pterocarpa* F.v.M.?; *H. callicarpa* Bunge; *Lilaeopsis* probably *L. australica* (F.v.M.) A. W. Hill, in pools in Deep Creek; *Eryngium vesiculosum* Labill.; **Bupleurum semicompositum* L.; *Daucus glochidiatus* (Labill.) Fisch., Mey et Ave-Lall., Native Carrot; *Trachymene heterophylla* F.v.M.; *Sium latifolium* L. var. *univittatum* J. M. Black, Water Parsnip; *Apium australe* Pet-Thou., Sea Celery; **Foeniculum vulgare* Mill., Fennel, Torrens Vale.

EPACRIDACEAE:—*Astrolonia humifusum* (Cav.) R. Br., Native Cranberry; *A. conostephioides* (Sond.) F.v.M., Flame Heath; *Leucopogon australis* R. Br.; *L. hirsutus* Sond., in swamps; *L. concurrens* F.v.M.; *Actrotriche serrulata* (Labill.) R. Br.; *Epacris impressa* Labill., White, Pink, or Red Heath; *Sprengelia incarnata* Sm., in swamps.

PRIMULACEAE:—**Anagallis arvensis* L., Scarlet Pimpernel.

LOGANIACEAE:—*Mitrasacme paradoxa* R. Br.; *Logania recurva* J. M. Black.

GENTIANACEAE:—**Erythraea Centaurium* Pers., Common Centaury; *Villursia exaltata* (Sims) F.v.M., in swamps.

CONVOLVULACEAE:—*Dichondra repens* Forst. et f.

LABIATAE:—*Mentha gracilis* R. Br.; *Lycopus australis* R. Br.; **Marrubium vulgare* L., Horehound, coast; *Scutellaria humilis* R. Br.

SOLANACEAE:—*Solanum nigrum* L., Black Nightshade; **S. sodomaeum* L., Apple of

Sodom, C. Jervis; **Lycium ferocissimum* Miers, African Box-Thorn, C. Jervis.

SCROPHULARIACEAE:—*Gratiola peruviana* L.; *Euphrasia collina* R. Br.; **Bartsia latifolia* (L.) Sibth., et Sm.; **B. viscosa* L.

LENTIBULARIACEAE:—*Utricularia dichotoma* Labill.

MYOPORACEAE:—*Myoporum viscosum* R. Br.; *M. insulare* R. Br., Blue-berry Tree.

PLANTAGINACEAE:—*Plantago varia* R. Br.; **P. lanceolata* L., Ribgrass.

RUBIACEAE:—*Opercularia varia* Hook. f.; *Asperula scoparii* Hook. f.

CAMPANULACEAE:—*Wahlenbergia Sieberi* A.DC.; *Lobelia anceps* Thunb.

GOODENIACEAE:—*Goodenia primulacea* Schlecht.; *G. ovata* Sm.; *G. amplexans* F.v.M., with rust, coast; *Scaevola microcarpa* Cav.; *Dampiera* sp.

BRUNONIACEAE:—*Brunonia australis* Sm., Blue Pincushion.

STYLIDIACEAE:—*Stylidium graminifolium* Swartz.

COMPOSITAE:—*Vittadinia triloba* (Gaudich.) DC.; *Olearia grandiflora* Hook.; *O. axillaris* (DC.) F.v.M., C. Jervis; *O. ramulosa* (Labill.) Benth.; *O. teretifolia* (Sond.) F.v.M.; *O. ciliata* (Benth.) F.v.M.; *Seigebekia orientalis* L.; *Cotula coronopifolia* L.; *Erechtites arguta* (A. Rich.) DC.; *E. quadridentata* (Labill.) DC.; *Senecio odoratus* Hornem var. *obtusifolius* J. M. Black, coast; **Cryptostemma calendulaceum* (L.) R. Br., Cape Dandelion; *Gnaphalium luteoalbum* L.; *Gn. japonicum* Thunb.; *Cassinia spectabilis* (Labill.) R. Br.; *Ixiolaena supina* F.v.M., coast; *Helichrysum bracteatum* (Vent.) Andrews; *H. Baxteri* A. Cunn.; *H. rutidolepis* DC.; *H. apiculatum* (Labill.) DC., C. Jervis; *Ixodia achilleoides* R. Br.; **Inula graveolens* (L.) Desf., Stinkwort; *Calocephalus Brownii* (Cass.) F.v.M., coast, Second Valley; *Craspedia uniflora* Forst. f., Bachelor's Button; **Cirsium lanceolatum* (L.) Scop., Spear Thistle; **Hypochoeris radicata* L., Rooted Cat's-ear; **Sonchus oleraceus* L., Sow-thistle; **S. asper* Hill, Prickly Sow-thistle.—By J. B. CLELAND.

Field Naturalists' Section of the Royal Society of S.A., Inc.

STATEMENT OF PAYMENTS AND RECEIPTS TO JULY 31, 1942.

EXPENDITURE.			INCOME.		
	£	s. d.		£	s. d.
To Printing the "S.A. Naturalist"	23	17 1	By Balance in Bank, 31/7/41	5	13 7
„ Blocks, Programmes, etc.	11	13 7	„ Subscriptions	£48	17 6
„ Postage	9	2 0	„ Donations	5	1 0
„ Transfer to "Colored Plates"				53	18 6
Account	6	10 6	„ Sales—		
„ Excursions and Conversazione	35	14 4	"Naturalist"	20	19 6
„ Honorarium to Hon. Secretary	5	0 0	Other Publications	0	13 6
„ Film and Epidiascope Hire	2	1 0	Badges	0	17 6
„ Library	0	11 0	„ Excursions and Conversazione	53	7 6
„ Sundries	1	4 0	„ Interest from Life Member-		
„ Balance in Bank, 31/7/42	43	18 1	ship Account	1	9 6
			„ Interest from General A/c	0	13 6
			„ Refund	1	18 6
	£139	11 7		£139	11 7

We have examined the books and vouchers setting forth the transactions of the Field Naturalists' Section of the Royal Society of S.A., Inc., for the year ending July 31, 1942, and certify that the above account of Income and Expenditure is correct.

(Signed) WALTER D. REED, F.C.A. (Aust.),) Auditors.
(Signed) BEVIS B. BECK,) August 27, 1942.

LIFE MEMBERSHIP ACCOUNT.

	£	s. d.		£	s. d.
Balance as at 31/7/41	16	17 0	Interest Transferred to General		
Interest	0	7 6	Account	1	9 6
			Balance in Bank as at July 31,		
			1942	15	15 0
	£17	4 6		£17	4 6

Examined and found correct.
August 27, 1942.

WALTER D. REED,) Auditors.
BEVIS B. BECK,)

COLOURED PLATES FUND.

	£	s. d.		£	s. d.
Transferred from General A/c	6	10 6	Balance in Savings Bank	6	11 6
Interest	0	1 0			
	£6	11 6		£6	11 6

Examined and found correct
August 27, 1942.

WALTER D. REED,) Auditors.
BEVIS B. BECK,)

STATEMENT OF ASSETS AND LIABILITIES.

ASSETS.			LIABILITIES.		
	£	s. d.		£	s. d.
Balance in Bank	43	18 1	Subscriptions Prepaid for 1942-3	3	16 3
Life Membership A/c	15	15 0	Balance of Assets over Liabilities	127	10 10
Colored Plates A/c	6	11 6			
Cupboards	3	17 6			
Film, "Toolach Wallaby"	15	0 0			
Outstanding Subscriptions to re-					
lise, say	4	12 6			
New Badges	1	2 6			
"S.A. Naturalists"	4	10 0			
Library	36	0 0			
	£131	7 1		£131	7 1

August, 1942.

BERNARD C. COTTON, President.
M. EMERSON, Hon. Treasurer.